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August 23, 2005

Docket Control  
Arizona Corporation Commission  
1200 West Washington  
Phoenix, Arizona 85007

RE: Distributed Generation Workshop: Proposed Distributed Generation Interconnection Requirements  
Docket No. E-00000A-99-0431

Dear Sir/Madam:

APS appreciates the opportunity to submit Proposed Distributed Generation Interconnection Requirements for consideration in this proceeding. We offer this document as a "strawman" for use in developing a final set of statewide standardized interconnection requirements and believe these Proposed Interconnection Requirements represent an excellent starting point for future Working group discussions. The content of these proposed requirements stems from Revision 3 of the Arizona State Draft Interconnection Requirements, which were developed during the 1999 Distributed Generation and Interconnections investigation conducted by the ACC. However, much effort has been made to include provisions from the comments filed by other Parties in this proceeding as well as reference to IEEE1547 and IEEE929. A sample Interconnection Agreement is also attached which we offer as basis for further consideration.

If you have any questions, please give me a call at 602-250-3933.

Sincerely,

David Rumolo  
Manager  
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DR/vld

Cc: Docket Control (Original, plus 13 copies)  
Erinn Andreasen  
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# **Proposed Distributed Generation Interconnection Requirements**

Distributed Generation Workshop: Interconnection Issues  
Docket No. E-0000A-99-0431

Submitted by: Arizona Public Service Company

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## **Arizona Public Service Company Proposed Distributed Generation Interconnection Requirements**

### **I. Scope and Procedure**

#### **A. Applicability:**

This document specifies the Arizona Utility Distribution Company (UDC or Utility) minimum requirements for safe and effective interconnection of distributed generation with a UDC radial distribution system (21 kV or less). Interconnection requirements as outlined here apply to Generating Facilities that will be connected to the UDC electric power distribution system and are not subject to the electric Utility's Open Access Transmission Tariff ("OATT").

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 4 (with some changes).*

#### **1. Size and Type of Facilities Which the Policy Applies to:**

These provisions apply to all distributed generation with nameplate continuous power ratings of 10 MW or less (per site), operating (or applying to operate) in parallel with a Utility distribution grid in Arizona. They also establish the technical and procedural requirements, terms, and conditions that will promote the safe and reliable parallel operation of on-site distributed generation. It includes the three distinct types of generators: (a) solid-state or static inverters, (b) induction machines, and (c) synchronous machines.

*This language was generally taken from the New 2005 Arizona Draft Interconnection Rule Submitted By: Arizona Solar Energy Industry Association, Distributed Energy Association of Arizona, Greater Tucson Coalition for Solar Energy, Intermountain Combined Heat and Power Center, Intermountain Combined Heat and Power Initiative, Southwest Energy Efficiency Project, Vote Solar Initiative, and Western Resource Advocates (Submitted July 29, 2005), at Section 1.1 (with some modifications).*

#### **2. Categories of Generator Size or Classes:**

The following size classifications are used in determining specific minimum protective requirements for the Generating Facility. Specified ratings are for each connection to the UDC's system. Customers must satisfy, in addition to the general requirements specified in these provisions, the minimum relaying requirements provided herein for each generator class.

- (a) Class I     --   50 kW or less, single or three phase
- (b) Class II    --   51 kW to 300 kW, three phase
- (c) Class III   --   301 kW to 5,000 kW, three phase

(d) Class IV -- over 5,000 kW, three phase

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 7.4 (with some modifications).*

### **3. Distributed Generation Types:**

Distributed generation is any type of Generating Facility, which has the potential (a) for feeding a Customer load, where this load can also be fed by, or connected to, the UDC's electrical distribution system, or (b) for electrically paralleling with, or for feeding power back into the UDC's electrical distribution system.

Distributed generators include induction and synchronous electrical generators as well as any type of electrical inverter capable of producing A/C power. A Separate System, or Emergency or Standby Generation System is one which is designed so as to never electrically interconnect or operate in electrical parallel with the UDC's system. A Parallel System, or Interconnected Generation System, is any generator or generation system that can parallel, or has the potential to be paralleled via design or normal operator control, either momentarily or on a continuous basis, with the UDC's system.

The Customer may elect to run his generator as a separate system with non-parallel load transfer between the two independent power systems, or he may run it in parallel with the UDC's system. A description and the basic requirements for these two methods of operation are outlined below.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 5 (with some modification).*

#### **(a) Separate System:**

A separate system is one in which there is no possibility of electrically connecting or operating the Customer's Generating Facility in parallel with the UDC's system. The Customer's equipment must transfer load between the two power systems in an open transition or non-parallel mode. If the Customer claims a separate system, the UDC may require verification that the transfer scheme meets the non-parallel requirements.

Emergency or Standby generators used to supply part or all of the Customer's load during a Utility power outage must be connected to the Customer's wiring through a double throw, "break-before-make" transfer switch specifically designed and installed for that purpose. The transfer switch must be of a fail-safe mechanical throw over design, which will, under no circumstances, allow the Generating Facility to electrically interconnect or parallel with UDC's system. The transfer switch must always disconnect the Customer's load from the UDC's power system

prior to connecting it to the Generating Facility. Conversely, the transfer switch must also disconnect the load from the Generating Facility prior to re-connecting it back to the UDC's system. These requirements apply to both actual emergency operations as well as to testing the Generating Facility. All transfer switches and transfer schemes must be listed by a Nationally Recognized Testing Laboratory ("NRTL") for the purpose as used, and also inspected and approved by the jurisdictional electrical inspection agency.

Portable Generating Facilities are not designed to be connected to a building's permanent wiring system, and are not to be connected to any such wiring unless a permanent and approved transfer switch is used. Failure to use a transfer switch can result in backfeed into the UDC system (the generator voltage can backfeed through the UDC transformer and be stepped up to a very high voltage). This can pose a potentially fatal shock hazard to anyone working on the power lines or on UDC equipment.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 5.1 (with some modifications).*

**(b) Parallel System:**

A parallel, or interconnected, generator is connected to a bus common with the UDC's system, and a transfer of power between the two systems is a direct result. A consequence of such interconnected operation is that the Customer's Generating Facility becomes an integral part of the distribution system that must be considered in the electrical protection and operation of the distribution system.

Parallel generators include any type of distributed generator or Generating Facility that can electrically parallel with, or potentially backfeed the UDC system. Additionally, any Generating Facility system using a "closed transition" type transfer switch or a multi-breaker transfer scheme, or an electrical inverter that can be configured or programmed to operate in a "utility interactive mode" constitutes a potential backfeed source to the UDC system, and is classified as an interconnected Generating Facility.

The UDC has specific interconnection and contractual requirements, as outlined in these provisions that must be complied with and information that needs to be submitted for all interconnected Generating Facilities. These include a "visible open" disconnect switch meeting certain requirements to isolate the Customer's system from the UDC's system, as well as protective relaying, metering, special rate schedules, and other safety and information requirements. The Customer will be responsible for having the Generating Facility system protective schemes tested by a qualified testing/calibration company. UDC personnel will inspect the system and the Customer will be required to sign an Interconnect Agreement and, as applicable, an Electric Supply/Purchase Agreement with the UDC. The UDC does not extend "blanket approval" to any specific type of Generating Facility or Generating Facility scheme since

each project is site specific and needs to be reviewed on a case-by-case basis.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 5.2 (with some modifications).*

#### **4. Other issues:**

##### **Jurisdiction:**

The rates, terms or other contract provisions governing the electric power sold to an Arizona Retail Customer are subject to the jurisdiction of the Arizona Corporation Commission ("ACC"). The ACC also has jurisdiction when the UDC purchases excess power from Customer owned Qualified Facilities (QFs) under 18 C.F.R. §§292.303, 292.306(2004).

The Federal Energy Regulatory Commission has jurisdiction over all interconnections with facilities that are subject to the electric public Utility's.

#### **B. Rights and Responsibilities:**

##### **1. UDC and Customer :**

##### **(a) Generating Facility Responsibilities:**

The Customer is responsible for all interconnection facilities required to be installed to interconnect the Customer's Generating Facility to the UDC system. This includes connection, transformation, switching, protective relaying, metering and safety equipment, including a visibly-open Disconnect Switch and any other requirements as outlined in these provisions or other special items specified by the Utility. All such interconnection facilities are to be installed by the Customer at its sole expense. In the event that additional facilities are required to be installed on the UDC's system to accommodate the Customer's generation, the UDC will install such facilities at the Customer's expense. The UDC may also charge the Customer for any administrative costs. The Customer shall reimburse the UDC for the actual interconnection study costs related to the Interconnection Application.

The Customer will own and be responsible for designing, installing, operating and maintaining:

- (i) The Generating Facility in accordance with the requirements of all applicable electric codes, laws and governmental agencies having jurisdiction.
- (ii) Control and protective devices, in addition to minimum protective relays and devices specified in this manual, to protect its facilities

from abnormal operating conditions such as, but not limited to, electric overloading, abnormal voltages, and fault currents. Such protective devices must promptly disconnect the Generating Facility from UDC's system in the event of a power outage on the UDC's system.

- (iii) Interconnection facilities on the Customer's premises as may be required to deliver power from the Customer's Generating Facility to the UDC's system at the Point of Interconnection.

The Customer shall maintain all Generating Facility and Interconnection Facility equipment in accordance with applicable manufacturers' maintenance schedule.

The Customer shall cause the design, installation, maintenance and operation of its Generating Facilities and Interconnection Facilities so as to reasonably minimize the likelihood of a malfunction or other disturbance, damaging, or otherwise affecting or impairing the UDC system.

*This language was generally taken from both Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 6 and the Electric Cooperative Comments submitted by Grand Canyon State Electric Cooperation Association, Inc. (GCSECA) on behalf of Arizona electric Power Cooperative, Inc., Duncan valley Electric Cooperative, Inc., Graham County Electric Cooperative, Inc., Mohave Electric Cooperative, Inc., Navopache Electric Cooperative, Inc., Trico Electric Cooperative, Inc., and Sulphur Springs valley electric Cooperative, Inc (with some modifications) .*

**(b) Agreements:**

All Customers interconnecting a generator in parallel with the UDC distribution system shall sign, in addition to any applicable purchase, supply or other standby or special agreement, as may be applicable, an Interconnection Agreement with the UDC.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 6.2 (with some modifications).*

**(c) Customer Rights:**

A Customer has the right to interconnect a Generating Facility with the UDC's electric distribution system, and UDCs are obligated to interconnect the Generating Facility, subject to the requirements set forth in these provisions.



The UDC will notify the Customer if there is any evidence that the Customer's Generating Facility or Interconnection Facilities operation causes disruption or deterioration of service to other customers served from the UDC system or if such operation causes damage to the UDC system. The Customer will notify the UDC of any emergency or hazardous condition or occurrence with their Generating Facility or Interconnection facilities, which could affect safe operation of the UDC system.

*This language was generally taken from the New 2005 Arizona Draft Interconnection Rule Submitted By: Arizona Solar Energy Industry Association, Distributed Energy Association of Arizona, Greater Tucson Coalition for Solar Energy, Intermountain Combined Heat and Power Center, Intermountain Combined Heat and Power Initiative, Southwest Energy Efficiency Project, Vote Solar Initiative, and Western Resource Advocates (Submitted July 29, 2005), at Section B.a (with some modifications).*

**(d) UDC:**

The UDC shall make reasonable efforts to meet all time frames provided in these procedures unless the UDC and the Customer mutually agree to a different schedule. If the UDC cannot meet a deadline provided herein, it shall notify the Customer, explain the reason for the failure to meet the deadline, and provide an estimated time when the applicable interconnection procedure will be completed.

*This language was generally taken from The Federal Energy Regulatory Commission's (FERC) Small Generation Interconnection Procedures (SGIP), at Section 4.1 (with some modifications)*

**2. Easements/Rights of Way:**

Where an easement or right of way is required to accommodate the interconnection, the Customer must provide to the UDC suitable easements or rights of way, in the UDC's name, on the premises owned, leased or otherwise controlled by the Customer. If the required easement or right of way is on another's property, the Customer must obtain and provide to the UDC a suitable easement or right of way, in the UDC's name, at the Customer's sole cost and in sufficient time to comply with the Interconnect Agreement requirements. All easements or rights of way must contain terms and conditions acceptable to the UDC.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Sections 8.1 as well as the Arizona Public Service Company's Interconnection Requirements for Distributed Generation (with some modifications).*

### **3. Insurance:**

The Customer shall maintain public liability and property damage insurance in amounts not less than ONE MILLION DOLLARS (\$1,000,000) per occurrence. Residential customers who operate a static inverter based Generating Facility rated less than 50 kW are exempt from this requirement.

At no time shall the UDC require that the Customer negotiate any policy or renewal of any policy covering any liability through a particular insurance company, agent, solicitor, or broker.

*This language was generally taken from the APS Interconnection requirements for Distributed Generation. However, this language also incorporates the recommendations included in the Distributed Generation Comments on Topics Provided by the ACC submitted by Deluge, Inc. and Universal energy & Environment (Submitted 7/29/05, at Section B.d and limits the exposure to generating facilities < 50kW. Additional Language was included from the New 2005 Arizona Draft Interconnection Rule Submitted By: Arizona Solar Energy Industry Association, Distributed Energy Association of Arizona, Greater Tucson Coalition for Solar Energy, Intermountain Combined Heat and Power Center, Intermountain Combined Heat and Power Initiative, Southwest Energy Efficiency Project, Vote Solar Initiative, and Western Resource Advocates (Submitted July 29, 2005), at Section 2.4 (with some modifications).*

### **4. Other Issues:**

#### **(a) Establishment of Point of Interconnection:**

UDC and Customer agree to interconnect the facilities at the Point of Interconnection in accordance with these provisions.

*This language generally was taken from the Electric Cooperative Comments submitted by Grand Canyon State Electric Cooperation Association, Inc. (GCSECA) on behalf of Arizona electric Power Cooperative, Inc., Duncan valley Electric Cooperative, Inc., Graham County Electric Cooperative, Inc., Mohave Electric Cooperative, Inc., Navopache Electric Cooperative, Inc., Trico Electric Cooperative, Inc., and Sulphur Springs valley electric Cooperative, Inc., at Section B (with some modifications).*

**(b) Force Majeure**

As used in these provisions, a Force Majeure event is any event: (a) that is beyond the reasonable control of the affected party; and (b) that the affected party is unable to prevent or provide against such occurrence by exercising reasonable diligence, including the following events or circumstances, but only to the extent that they satisfy the preceding requirements: acts of war, public disorder, rebellion or insurrection; floods, hurricanes, earthquakes, lighting, storms or other natural calamities; explosions or fires; strikes, work stoppages or labor disputes; embargoes; and sabotage. If a Force Majeure event prevents a party from fulfilling any obligations under these provisions, such party will promptly notify the other party in writing and will keep the other party informed on a continuing basis as to the scope and duration of the Force Majeure event. The affected party will specify the circumstances of the Force Majeure event, its expected duration and the steps that the affected party is taking to mitigate the effect of the event on its performance. The affected party will be entitled to suspend or modify its performance of obligations under these provisions but will use reasonable efforts to resume its performance as soon as possible.

The Customer shall assume all liability for and shall indemnify the UDC and shall hold it harmless from and against any claims, losses, costs, and expenses of any kind or character to the extent that they result from Customer's negligence or other wrongful conduct in connection with the design, construction, installation, operation or maintenance of the Generating Facilities or Interconnection Facilities. Such indemnity shall include, but is not limited to, financial responsibility for (a) monetary losses; (b) reasonable costs and expenses of defending an action or claim; (c) damages related to death or injury; (d) damages to property; and (e) damages for the disruption of business.

*This language generally was taken from the Electric Cooperative Comments submitted by Grand Canyon State Electric Cooperation Association, Inc. (GCSECA) on behalf of Arizona electric Power Cooperative, Inc., Duncan valley Electric Cooperative, Inc., Graham County Electric Cooperative, Inc., Mohave Electric Cooperative, Inc., Navopache Electric Cooperative, Inc., Trico Electric Cooperative, Inc., and Sulphur Springs valley electric Cooperative, Inc., at Section B.d (with some modifications)..*

**C. Definitions:**

**The following terms, as used in this manual, shall have the meanings specified:**

1. Applicant: A person or entity that has filed an Interconnection Application to interconnect a Generation Facility with the electric Utility (UDC).
2. Application: The standard form(s), attached as "Attachment A", used for applying to electrically interconnect a Generation Facility with the UDC's electric distribution system. Also referred to as an Interconnection Application.
3. Business Day: Monday through Friday, excluding Federal and Arizona State Holidays.
4. Cogeneration Facility: Any facility that sequentially produces electricity, steam or forms of useful energy (e.g., heat) from the same fuel source and which are used for industrial, commercial, heating, or cooling purposes.
5. Customer: Any entity, including the UDC or any of its affiliates or subsidiaries, that proposes to interconnect its small Generating Facility with the UDC's Distribution System.
6. Distributed Generator: Any type of electrical generator or static inverter producing alternating current that (a) has the capability of parallel operation with the Utility distribution system, or (b) is designed to operate separately from the Utility system and can feed a load that can also be fed by the Utility electrical system. A distributed generator is sometimes referred to simply as "generator".
7. Electric Supply/Purchase Agreement: An agreement, together with appendices, signed between the UDC and the Customer covering the terms and conditions under which electrical power is supplied and/or purchased to or from the UDC.
8. Fault Current: Electrical current that flows through a circuit as a result of an electrical fault. A fault current is many times larger in magnitude than the current that normally flows through a circuit.
9. Generating Facility (GF): All or part of the Customer's distributed electrical generator(s) or inverter(s) together with all protective, safety, and associated equipment necessary to produce electric power at the Customer's facility. A GF also includes any Qualifying Facility (QF).
10. IEEE: The Institute of Electrical and Electronic Engineers

11. IEEE Standards: The standards published by the Institute of Electrical and Electronic Engineers, available at [www.ieee.org](http://www.ieee.org)
12. Interconnection Agreement: An agreement, together with appendices, signed between the Utility and the Customer covering the Terms and conditions governing the interconnection and operation of the Generating Facility with the UDC.
13. Interconnection: The physical connection of the Generating Facility to the UDC's distribution system in accordance with these requirements so that safe and reliable parallel operation can occur.
14. Interconnection Study: A study or studies that may be undertaken by the UDC in response to its receipt of a completed Application for interconnection and parallel operation with the UDC's distribution system. Interconnection studies may include, but are not limited to, studying service studies, coordination studies and utility system impact studies.
15. Islanding: A condition occurring when a generator and a portion of the UDC's distribution system separate from the remainder of the Utility system and continue to operate in an energized state (copyright EPRI).
16. Minimum Protective Devices, Relays, and Interconnection Requirements: The minimum required protective relaying and/or safety devices or requirements specified in these provisions that are for the purpose of protecting only UDC and other customer facilities from damage or disruptions caused by a fault, malfunction or improper operation of the Customer's Generating Facility. Minimum Protective Relaying and Interconnection Requirements do not include relaying, protective or safety devices as may be required by industry and/or government codes and standards, equipment manufacturing and prudent engineering design and practice to fully protect the Customer's Generating Facility or facilities; those are the sole responsibility of the Customer.
17. Parallel Operation: The operation of a Generating Facility that is electrically interconnected to a bus common with the UDC's electric distribution electrical system, either on a momentary or continuous basis.
18. Party or Parties: The UDC, Customer or any combination of the above.
19. Point of Common Coupling: The point in the interconnection of a Generator Facility with the UDC's electric service conductors.
20. Point(s) of Interconnection: The physical location(s) where the Utility's service conductors are connected to the customer's service conductors to allow parallel operation of the Customer's Generating Facility with the UDC's electric distribution system.

21. Pre-certified (or Certified) Equipment: A specific generating and protective equipment system or systems that have been certified as meeting the applicable parts of these provisions relating to testing, operation and safety as specified in this manual.
22. Qualifying Facility (QF): Any Cogeneration or Small Power Production Facility that meets the criteria for size, fuel use, efficiency, and ownership as defined at 18 CFR, Chapter I, Part 292, Subpart B of the Federal Energy Regulatory Commission's Regulations.
23. Primary network: An AC power distribution system that uses 2 or more dedicated primary voltage feeders to supply power to one customer. The system includes automatic protective devices intended to isolate faulted primary feeders, while maintaining service to the customer served from the other primary feeder circuit(s).
24. Relay: An electric device that is designed to interpret input conditions in a prescribed manner and after specified conditions are met to respond to cause contact operation or similar abrupt change in associated electric control circuits.
25. Secondary Spot Network System: An AC power distribution system in which a customer is served from three-phase, four-wire low-voltage (typically 480V) circuits supplied by two or more network transformers whose low-voltage terminals are connected to the low-voltage circuits through network protectors. The low voltage circuits do not have ties to adjacent or nearby secondary network systems. The secondary spot network system has two or more high-voltage primary feeders. These primary feeders are either dedicated network feeders that serve only other network transformers, or a non-dedicated network feeder that serves radial transformers in addition to the network transformer(s), depending on network size and design. The system includes automatic protective devices and fuses intended to isolate faulted primary feeders, network transformers, or low-voltage cable sections while maintaining service to the customers served from the low-voltage circuits.
26. Small Power Production Facility: A facility that uses primarily biomass, waste or renewable resources, including wind, solar, or water to produce electric power.
27. Utility: The electric Utility that constructs, operates and maintains the electrical distribution system for the receipt and/or delivery of power, also referred to the Utility Distribution Company (UDC).
28. Utility Grade Relays: Relays specifically designed to protect and control electric power apparatus, tested in accordance with the following ANSI/IEEE standards:
  - (a) ANSI/IEEE C37.90-1989 (R1994), IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus.

- (b) ANSI/IEEE C37.9.01-1989 (R1994), IEEE Standard Surge Withstand (SWC) Tests for Protective Relays and Relay Systems.
- (c) ANSI/IEEE C37.90.2-1995, IEEE Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers.

*This language was generally taken from Arizona Public Service Company's Interconnection Requirements for Distributed Generation, as well as, Arizona Public Service Company's Interconnection Requirements for Distributed Generation, Rev. 3., Salt River Project's Interconnection Guidelines for Distributed Generation, December 2000 (with some modifications).*

#### **D. Interconnection Process/Procedures:**

##### **1. Procedures Addressing Interconnections:**

Any qualified Customer may operate its generating equipment in parallel with the UDC's radial distribution system provided the Customer provides equipment that will:

- (a) not present any hazards to UDC personnel, other customers or the public,
- (b) minimize the possibility of damage to UDC's electric power system and other customer equipment,
- (c) not adversely affect the quality of service to other customers, and
- (d) minimally hamper efforts to restore a feeder to service (specifically when a clearance is required).

In addition, the Customer shall comply with the following:

- (a) The Generating Facility shall meet all the minimum interconnection, safety, and protection requirements outlined in this manual,
- (b) Customer shall sign an Interconnect Agreement, as well as an Electric Supply /Purchase Agreement, as applicable, with UDC, and
- (c) Customer shall comply with and is subject to all applicable service and rate schedules and requirements, rate tariffs and other applicable requirements as filed with and approved by the ACC.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 4 (with some modifications).*

##### **2. Equipment Pre-Certification:**

- (a) **Compliance with codes and standards.** In order to qualify as "Certified" for any interconnection procedures, relevant equipment shall comply with the following codes, guides and standards as applicable, and as specified in this document:

- (i) IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems (including use of IEEE 1547.1 testing protocols to establish conformity)
- (ii) IEEE 1547.1 Standard for Conformance Testing Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems.
- (iii) UL 1741 Inverters, Converters, and Controllers for Use in Independent Power Systems
- (iv) IEEE Std 929-2000 IEEE Recommended Practice for Utility Interface of Photovoltaic (PV) Systems
- (v) NFPA 70 (2002), National Electrical Code
- (vi) IEEE Std C37.90.1-1989 (R1994), IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems
- (vii) IEEE Std C37.90.2 (1995), IEEE Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers
- (viii) IEEE Std C37.108-1989 (R2002), IEEE Guide for the Protection of Network Transformers
- (ix) IEEE Std C57.12.44-2000, IEEE Standard Requirements for Secondary Network Protectors
- (x) IEEE Std C62.41.2-2002, IEEE Recommended Practice on Characterization of Surges in Low Voltage (1000V and Less) AC Power Circuits
- (xi) IEEE Std C62.45-1992 (R2002), IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000V and Less) AC Power Circuits
- (xii) ANSI C84.1-1995 Electric Power Systems and Equipment – Voltage Ratings (60 Hertz)
- (xiii) IEEE Std 100-2000, IEEE Standard Dictionary of Electrical and Electronic Terms NEMA MG 1-1998, Motors and Small Resources, Revision 3
- (xiv) IEEE Std 519-1992, IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
- (xv) NEMA MG 1-2003 (Rev 2004), Motors and Generators, Rev. 1.



- (b) Generating Facility equipment proposed for use separately or packaged with other equipment in an interconnection system shall be considered Certified for interconnected operation if (1) it has been tested in accordance with industry standards for continuous utility interactive operation in compliance with the appropriate codes and standards referenced below by any Nationally Recognized Testing Laboratory (NRTL) recognized by the United States Occupational Safety and Health Administration to test and certify interconnection equipment pursuant to the relevant codes and standards listed above, (2) it has been labeled and is publicly listed by such NRTL at the time of the interconnection application, and (3) such NRTL makes readily available for verification all test standards and procedures it utilized in performing such equipment certification, and, with consumer approval, the test data itself. The NRTL may make such information available on its website and by encouraging such information to be included in the manufacturer's literature accompanying the equipment.
- (c) The Customer must verify that the intended use of the equipment falls within the use or uses for which the equipment was tested, labeled, and listed by the NRTL.
- (d) Certified equipment shall not require further type-test review, testing, or additional equipment to meet the requirements of this interconnection procedure; however, nothing herein shall preclude the need for project interconnection review and approval by the UDC or on-site commissioning testing prior to the interconnection nor follow-up production testing by the NRTL.
- (e) If the certified equipment package includes only interface components (switchgear, inverters, or other interface devices), then a Customer must show that the Generating Facility or other electric source being utilized with the equipment package is compatible with the equipment package and is consistent with the testing and listing specified for this type of interconnection equipment.
- (f) An equipment package does not include equipment provided by the UDC.

This section combines language generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99) at section 3, FERC's SGIP, at Attachment 4, and the New 2005 Arizona Draft Interconnection Rule Submitted By: Arizona Solar Energy Industry Association, Distributed Energy Association of Arizona, Greater Tucson Coalition for Solar Energy, Intermountain Combined Heat and Power Center, Intermountain Combined Heat and Power Initiative, Southwest Energy Efficiency Project, Vote Solar Initiative, and Western Resource Advocates (Submitted July 29, 2005), at Section 4.10 (with some modifications).

**3. Utility Reporting Requirements to the Commission:**

- (a) Each UDC shall adopt a distributed generation system interconnection requirements manual (DG Interconnection Manual) no later than sixty days after adoption of these provisions by the ACC. Each DG Manual shall contain detailed specifications and technical requirements necessary to interconnect a Generating Facility to each UDC's respective distribution system. Each UDC shall file its DG Interconnection Manual with the ACC sixty days after adoption of these rules. An updated DG Interconnection Manual shall be provided to the ACC upon any revision by the UDC.

**(a) Documentation of projects:**

Each UDC shall maintain records concerning Applications received for interconnection and parallel operation of Generating Facilities. Such records will include the date each Application is received, documents generated in the course of processing each Application, correspondence regarding each Application, and the final disposition of each Application.

**(b) Annual interconnection report to the ACC:**

The UDC will report to the Commission on an annual basis the status of Distributed Generation interconnected with the UDC distribution system in accordance with current ACC reporting requirements.

**4. Interconnection Dispute Resolution Process:**

If a dispute arises between the Parties regarding the interpretation of these provisions, a Party's performance of its obligations as stated in these provisions, or any other matter governed by these provisions, the Parties agree that such dispute will be resolved in the manner described below:

- (a) **Initiation and Response:** Promptly upon the occurrence of the dispute, the aggrieved Party will notify the other Party (the "Claimant's Statement") in writing setting forth in sufficient detail the basis for the dispute, the aggrieved Party's position and its proposal for resolution of the dispute. Within ten (10) Business Days following receipt of the Claimant's Statement, the other Party will respond in writing (the "Responsive Statement") setting forth in sufficient detail the Respondent's position and its proposal for resolution of the dispute.
- (b) **Good Faith Negotiation:** Within ten (10) Business Days after the aggrieved Party's receipt of the Responsive Statement, the Parties will meet and attempt in good faith to expeditiously negotiate a resolution to the dispute. In attendance for each Party at the opening session and throughout the dispute resolution procedure as described in this Section will be a representative or representatives from each Party who are

authorized to act for the Party and resolve the dispute without resort to higher authority.

- (c) **Mediation:** If the Parties cannot reach a mutually acceptable solution within thirty (30) Business Days after the discussions begin, either Party may refer the matter to the Arizona Disputes Resolution Association for appointment of a qualified mediator who has no interest in the outcome of the dispute and who is qualified in the mediation of commercial disputes as the case may be. The mediator shall be guided by the Parties desire that their objectives are attained as expressed in these provisions, that their relationship be preserved, and that the dispute be resolved in a fair and equitable manner.
- (d) **Confidentiality:** Negotiations undertaken pursuant to this Section shall be deemed confidential as settlement discussions. Nothing said by a Party, nor any position taken during the course of negotiations will be introduced as evidence by the opposing Party in any subsequent litigation concerning the same or related transactions.
- (e) **Condition Precedent:** The exhaustion of the dispute resolution procedure provided for in this Section will be construed to be a condition precedent to the initiation of arbitration or legal action in a court of law

*This language was generally taken from a sample Interconnection Agreement for the Interconnection of Customer's Generating Facility to the APS Distribution System, at Section 20(with some modifications).*

## **5. Disconnect From or Reconnect With the Grid Procedure:**

A UDC may disconnect a Customer's Generating Facility from the UDC system under the following conditions:

### **(a) Expiration or Termination of Interconnection Agreement:**

The Interconnection Agreement specifies the effective term and termination rights of UDC and Customer. Upon expiration or termination of the Interconnection Agreement with a Customer, in accordance with the terms of the Interconnection Agreement, the UDC may disconnect the Customer's Generating Facilities.

### **(b) Non-compliance with the technical requirements specified in these provisions:**

A UDC may disconnect a Customer's Generating Facility if the Generating Facility is not in compliance with the technical or contractual requirements specified in these provisions or the applicable Agreements in effect. Within five Business Days from the time the Customer notifies the UDC that the Generating Facility has been restored to compliance, the UDC shall verify such compliance. Upon such verification, the UDC will

allow the Generating Facility to be re-connected subject to the terms and conditions of the applicable agreements in effect. In the event the UDC is unable to disconnect the Generating Facility in an expeditious manner for whatever reason, the UDC retains the right to de-energize or terminate electric service to the Customer.

**(c) System Emergency.**

With respect to the protection of the UDC system and the safety of its workers, a Utility may temporarily disconnect a Customer's Generating Facility without prior notice in cases where continued operation of the Generating Facility will endanger persons or property.

During the forced outage of the UDC system, the UDC shall have the right to temporarily disconnect a Customer's Generating Facility to make repairs to the UDC's system.

**(d) Routine Maintenance, Repairs, and Modifications:**

A UDC may disconnect a Customer or a Customer's Generating Facility or electric service in the event of a service interruption for routine maintenance, repairs, and UDC system modifications. The UDC shall make reasonable effort to give the Customer advance notice of such disconnection or interruption of electric service. The Parties shall cooperate with each other to restore the Small Generating Facility, Interconnection Facilities, and the UDC's Distribution System to their normal operating state as soon as reasonably practicable following a temporary disconnection.

**(e) Lack of Approved Interconnection Agreement:**

In order to interconnect a Customer's Generating Facility to a UDC system, a Customer must first submit to the UDC an Application for interconnection and parallel operation with the UDC system and execute all applicable Agreement(s). The UDC may refuse to connect or may disconnect the Customer's Generating Facility, or may terminate electric service to a Customer operating an interconnected Generating Facility in the absence of a valid Interconnection Agreement or Non-Parallel Connection Agreement.

The Customer retains the option to temporarily disconnect from the UDC's system at any time subject to the terms and conditions of any applicable agreements in effect. Such temporary disconnection shall not result in termination of the Interconnection Agreement unless specified as such.

*This language was developed by combining language from:*

- *New 2005 Arizona Draft Interconnection Rule Submitted By: Arizona Solar Energy Industry Association, Distributed Energy Association of Arizona, Greater Tucson Coalition for Solar Energy, Intermountain Combined Heat and Power Center, Intermountain Combined Heat and Power Initiative, Southwest Energy Efficiency Project, Vote Solar Initiative, and Western Resource Advocates (Submitted July 29, 2005), at Section 4.12 (with some modifications).*
- *Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Exhibit 8 (with some modifications).*
- *Arizona Public Service Company's Interconnection Requirements for Distributed Generation, Rev. 3.*
- *Salt River Project's Interconnection Guidelines for Distributed Generation, December 2000.*

#### **E. Application Process and Document Requirements:**

A request to interconnect a certified inverter-based Generating Facility no larger than 10 kW may be evaluated under the 10 kW Inverter Process. A request to interconnect a Small Generating Facility no larger than 1 MW may be evaluated under the Fast Track Process. A request to interconnect a Generating Facility larger than 1 MW but no larger than 10 MW shall be evaluated under the Study Process.

Prior to submitting its Interconnection Application, the Customer may seek information on the application process and interconnection requirements from the UDC's distribution interconnection contact employee or office by way of an informal request.

Nothing in the proceeding processes shall preclude the Customer and UDC from mutually agreeing to different time frames and/or procedures.

##### **1. 10 kW Inverter Process**

The 10 kW Inverter Process is available to a Customer proposing to interconnect either a single static (solid-state based) DC to AC inverter, with a continuous nameplate output power rating of 10 kW or less to the UDC's distribution system, or multiple static DC to AC inverters with a combined continuous power nameplate rating of 10 kW or less to the UDC's distribution system. Such inverter(s) shall be listed to UL1741, and certified to meet the shutdown protective functions (under/over voltage, under/over frequency and anti-islanding) specified in IEEE 929. The Generating Facility is also required to meet all appropriate codes, standards, and UDC interconnection and contractual requirements.

The 10 kW Inverter Process steps are as follows:

- (a) The Customer contacts the UDC for an interconnection information package and outlines the proposed project. The UDC forwards the

appropriate information to the Customer within five (5) Business Days and provides a UDC contact name and telephone number.

- (b) If the Customer decides to proceed with the project, the Customer must complete the Interconnection Application (Application) and submit it to the UDC along with all required supplemental information (e.g. electrical diagrams, protective relaying and settings, site plan and plant location diagrams, etc.). A non-refundable fifty dollar (\$50) processing fee shall be submitted by the Customer along with the Application. Any subsequent application re-submission or Generating Facility modification require an additional fifty dollar (\$50) processing fee.
- (c) The UDC shall notify the Customer that it received the Interconnection Application within three (3) Business Days of receipt.
- (d) The UDC shall notify the Customer within ten (10) Business Days of receipt of the Application whether it is complete or incomplete. If the Application is incomplete, the UDC shall advise the Customer what information or material is missing.
- (e) The Customer has ten (10) Business Days after receipt of such notification to submit the required information or material. If the Customer does not provide the required information or material within the deadline, the Interconnection Application shall be deemed withdrawn. The UDC shall notify the Customer within ten (10) Business Days, following receipt of requested information, as to whether or not the information provided is complete.
- (f) Following receipt of a complete Interconnection Application (and all required supplemental information), the UDC conducts an initial review and verifies conformance to the interconnection requirements within ten (10) Business Days and notifies the Customer that:
  - (i) The proposed Generating Facility design appears to meet all interconnection requirements and that the Interconnection Application is approved as submitted. Appropriate agreements will be prepared by the UDC and forwarded to the Customer for review and signature in accordance with Step (h) below.
  - (ii) The proposed Generating Facility design has failed to meet one or more of the interconnection requirements, and that the Interconnection Application is denied. The UDC shall provide an explanation of the reason(s) for the denial, and specify what additional information and/or modifications to the Customer's Generating Facility are required in order to obtain an approval of the proposed design.
- (g) If the Application is denied, the Customer shall notify the UDC within ten (10) Business Days whether or not it wishes to proceed with the project.

If the Customer does not wish to proceed with the project, or the UDC is not notified within the specified time frame, the Application shall be deemed withdrawn. If the Customer desires to proceed with the project, then a new Application accompanied by a processing fee of the thirty dollars (\$30) shall be submitted to the UDC for the review and processing. (Step (b) above is re-initiated).

- (h) If the Generating Facility Interconnection Application meets all of the applicable requirements and the Application is approved, the UDC shall, within five (5) Business Days after the notice of Application approval, send to the Customer the appropriate agreements for review and signature.
- (i) After receiving the agreements (or revisions to any agreements), the Customer shall review, sign and return the agreements, along with evidence of insurance coverage if required, to the UDC at least five (5) Business Days prior to scheduling the project UDC site inspection date.
- (j) The Customer shall complete the Generating Facility project and contact the UDC to schedule the site inspection no later than thirty (30) days after the anticipated start-up date for operation as provided to the UDC. The UDC shall have the right to terminate any agreements, and the Interconnection Application may be deemed withdrawn in the event that this time frame is exceeded.
- (k) Customer shall provide the UDC with at least ten (10) Business Days notice to schedule the UDC site inspection and to witness the inverter shutdown testing. There will be no charge for one initial site inspection by the UDC. The UDC may schedule metering replacement, if necessary, and labeling Utility equipment to occur at the same time.
- (l) The UDC performs the site inspection as arranged and verifies that the Generating Facility, as best as can be determined, is in compliance with all applicable interconnection and code requirements. At a minimum, the UDC shall verify the following:
  - (i) An electrical permit and/or clearance has been issued by the Authority Having Jurisdiction (if required).
  - (ii) All Generating Facility equipment is properly labeled.
  - (iii) Generating Facility system layout is in accordance with the plant location and site plan(s) submitted to the UDC.
  - (iv) Inverter nameplate ratings are consistent with the information submitted to the UDC.
  - (v) UDC has unimpeded access to the Disconnect Switch, and that the switch meets all requirements as specified herein.
  - (vi) The inverter shuts down as required upon simulated loss of Utility voltage.
  - (vii) The Generating Facility is wired, as best as can be determined, in accordance with the electrical diagrams submitted to the UDC.

The UDC shall, at the time of the site inspection, or prior thereto:

- (i) Install all appropriate metering if required.
- (ii) Label all Utility equipment; and
- (iii) Ensure that the Generating Facility is properly incorporated onto UDC operating maps and identified as a backfeed source.

The UDC shall not have the right to fail a Site Inspection in the event the above requirements (metering, utility equipment labeling and identification of the GF on the operating maps) are not in place at the time of the Site Inspection.

(m) Immediately following completion of the site inspection (and upon receipt of all final applicable signed interconnection documents) the UDC shall determine whether or not the Generating Facility meets all applicable requirements, and shall notify the Customer that:

- (i) The Generation Facility appears to comply with all necessary requirements, and that it may be operated in parallel with the UDC's distribution system per the agreed terms and conditions. Within one (1) Business Day, following such notification the UDC shall provide the Customer with such notice in writing.
- (ii) The Generating Facility has failed to meet one or more of the applicable requirements and that permission to parallel is denied. The UDC shall provide an explanation of the reason(s) for denial. If the abovementioned inspection or equipment testing is not satisfactory, the UDC shall have the right to disconnect and lock out the Generating Facility, and the Customer must re-schedule the site inspection with the UDC. The Customer may not operate in parallel until it receives written approval from the UDC, and violation of this condition precedent may result in immediate termination of electric service to the Customer.

(n) In the event that the Generating Facility does not pass the initial UDC site inspection the Customer must correct any outstanding issues and re-schedule any site inspection, as required, with the UDC per step (k). A one hundred dollar (\$100) fee will apply to any re-inspection conducted by the UDC.

If updated diagrams are required to reflect as-built conditions, the Customer must submit these to the UDC along with a thirty dollar (\$30) processing fee and the UDC will process and mail an amendment to the Interconnection Agreement within five (5) Business Days after receipt (and acceptance) of the revised diagrams for Customer review and signature.

(o) Within one (1) Business Day following execution of the amended Agreement(s) and completion of any site re-inspection, if required, the



UDC will provide written notification to the Customer that the Generation Facility may be operated in parallel with the UDC's distribution system per the agreed terms and conditions.

If an Application under the 10 kW Inverter Process is denied because it does not meet one or more of the applicable requirements, a Customer may resubmit the Application under the Fast Track Process.

*This process was developed primarily by combining language from:*

- *New 2005 Arizona Draft Interconnection Rule Submitted By: Arizona Solar Energy Industry Association, Distributed Energy Association of Arizona, Greater Tucson Coalition for Solar Energy, Intermountain Combined Heat and Power Center, Intermountain Combined Heat and Power Initiative, Southwest Energy Efficiency Project, Vote Solar Initiative, and Western Resource Advocates (Submitted July 29, 2005), at Section 4.3 (with some modifications).*
- *Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Exhibit 3 (with some modifications).*

## **2. Fast Track Process:**

The Fast Track Process is available to a Customer proposing to interconnect its Generating Facility with the UDC's Distribution System if the Generating Facility is no larger than 1 MW and if the Customer's proposed Generating Facility meets all appropriate codes, standards and UDC interconnection and contractual requirements, and the UDC determines that no further study is required. In certain instances, if an Interconnection Application is submitted under the Fast Track Process, but it is subsequently determined that a study is required, the Application will then be reviewed under the Study Process.

The Fast Track Process steps are as follows:

- (a) The Customer contacts the UDC for an interconnection information package and outlines the proposed project. The UDC forwards appropriate information to Customer within five (5) Business Days and provides a UDC contact name and telephone number.
- (b) (Optional) The Customer is encouraged, especially in the case of rotating machinery installations, to contact and/or meet with the UDC at the conceptual stage of the project and discuss proposed installation/design options and proposed operation with the UDC. A preliminary electrical one-line diagram would be very helpful at this stage. This step will ensure that:
  - (i) The Generating Facility project proceeds smoothly and in a timely manner.

- (ii) The UDC and Customer understand upfront whether any special considerations, protective equipment, system modifications or studies may be required.
  - (iii) Applicable interconnect, contractual and protective requirements are properly understood and implemented.
- (c) If the Customer decides to proceed with the project, the Customer must complete the Interconnection Application (Application) and submit it to the UDC along with all supplemental information. (e.g. electrical diagrams, protective relaying and settings, site plan and plant location diagrams, etc.). A non-refundable processing fee of one hundred dollars (\$100) shall be submitted by the Customer along with the Application, or any re-submission of an Application or modification thereto, for an inverter-based Generating Facility where the total combined continuous nameplate output power rating of the inverter(s) does not exceed 50 kW. A non-refundable processing fee of two hundred and fifty dollars (\$250) will apply to any other Generating Facility.
- (d) The UDC shall notify the Customer that it received the Interconnection Application within three (3) Business Days of receipt.
- (e) The UDC shall notify the Customer within ten (10) Business Days of receipt of the Interconnection Application whether it is complete or incomplete. If the Application is incomplete, the UDC shall advise the Customer what information or material is missing.
- (f) The Customer has twenty (20) Business Days after receipt of such notification to submit the required information and/or material, or to request an extension of time to provide such information. If the Customer does not provide the required information and/or material or request an extension of time within the deadline, the Interconnection Application shall be deemed withdrawn. The UDC shall notify the Customer within ten (10) Business Days, following receipt of the requested information, as to whether or not the Application is complete.
- (g) Following receipt of a complete Interconnection Application and all required supplemental information, and within twenty (20) Business Days after the UDC notifies the Customer that the Interconnection Application is complete, the UDC shall review the proposed interconnection information to determine whether the proposed Generation Facility design meets the applicable interconnection requirements. During this initial review, the UDC may perform limited studies, at its cost, to evaluate the proposed interconnection. This review shall result in one of the following determinations and Customer notifications:
  - (i) The Generating Facility design as submitted appears to meet all applicable interconnection requirements and no further studies, special protective requirements or system modifications are

required. In this case, the UDC shall notify the Customer that the Application is approved and that appropriate agreements will be prepared by the UDC and forwarded to the Customer for review and signature in accordance with step (i) below.

(ii) The proposed Generating Facility design does not meet the applicable interconnection requirements as proposed, or that additional information is needed from the Customer, because of one or more of the following conditions:

- a. Modifications are needed to the proposed Generating Facility interconnection design.
- b. Additional information or data (e.g. fault data) is needed from the Customer to complete the review/study.
- c. Modifications are needed to the Utility system.
- d. Special protective requirements apply (e.g. transfer trip).

The UDC will provide the customer with an explanation of each of the applicable conditions identified above that will need to be resolved, along with any estimated costs and time frames, if applicable, in order to obtain UDC approval of the interconnection design.

- e. The UDC review has determined that a study will need to be conducted to determine as to whether the Generating Facility can be safely and properly interconnected, and that the Interconnection Application will need to be processed under the "Study Process."
  - f. The proposed Generating Facility design has failed to meet one or more of the applicable interconnection requirements and the review indicates that the Generating Facility could not be interconnected to the proposed distribution feeder in a safe or reliable manner, or that such interconnection would be cost prohibitive or impractical. In such a case, the UDC shall notify the Customer that the Application has been denied, and shall provide an explanation of the reason(s) for the denial.
- (h) The Customer shall, within ten (10) Business Days following receipt of such UDC notification, notify the UDC as to whether or not it wishes to proceed with the project. If the Customer does not wish to proceed with the project, or does not notify the UDC of its intention within this time-frame, the Application shall be deemed withdrawn. If the Customer wishes to proceed with the project, then Customer shall within twenty (20) Business Days following receipt of the UDC notification, submit to the UDC:
- (i) Required modifications to the proposed Generating Facility design if applicable.

- (ii) Any additional information or data as requested.
- (iii) Arrange with the UDC for the UDC to implement any required modifications to its system. Customer and UDC will agree on the reimbursable costs, required deposit and time-frame(s) for such modifications.
- (iv) Work with the UDC on the implementation of any special protective requirements that may apply. Customer and UDC will agree in writing on the reimbursable costs, required deposit and time-frame(s).
- (v) Written request to process the Application under the "Study Process", if applicable, along with any processing fee differential applicable.

(Note: Upon submission of modifications or additional information by Customer to UDC, step (g) is re-initiated. A non-refundable fifty dollar (\$50) processing fee shall be submitted along with every submission of modifications submitted under the Fast Track Application).

- (i) If the Generating Facility Interconnection Application meets all of the applicable interconnection requirements and the Application is approved, the UDC shall, within five (5) Business Days after the notice of Application approval, send to the Customer the appropriate agreements for review and signature.
- (j) After receiving the agreements (or revisions to any agreements), the Customer shall review, sign and return the agreements, along with evidence of insurance coverage if required to the UDC at least five (5) Business Days prior to scheduling the UDC site inspection date.
- (k) The UDC, in conjunction with the Customer as necessary, will effect any distribution system modifications or special protective requirements that might be applicable in accordance with the agreed terms and time-frames.
- (l) The Customer shall complete the Generating Facility project and schedule the UDC site inspection no later than sixty (60) Business Days after the anticipated start-up date for operation as provided to the UDC. The UDC shall have the right to terminate any agreements, and the Interconnection Application may be deemed withdrawn, in the event that this time frame is exceeded.
- (m) Customer shall provide the UDC with at least ten (10) Business Days notice to schedule the UDC site inspection and to witness protective device tests. There will be no charge for one initial site inspection by the UDC. The UDC may schedule metering replacement, if necessary, and labeling of utility equipment to occur at the same time.
- (n) The UDC performs the site inspection as arranged and verifies that the Generating Facility, as best as can be determined, is in compliance with all

applicable interconnection and code requirements. At a minimum, the UDC shall verify the following:

- (i) An electrical permit and/or clearance has been issued by the Authority Having Jurisdiction if required.
- (ii) All Generating Facility equipment is properly labeled.
- (iii) Generating Facility system layout is in accordance with the plant location and site plan(s) submitted to the UDC.
- (iv) Generator nameplate ratings are consistent with the information submitted to the UDC.
- (v) UDC has unimpeded access to the Disconnect Switch, and that the switch meets all requirements as specified herein.
- (vi) An inverter based system shuts down as required upon simulated loss of utility voltage. For a rotating machinery based system, UDC will witness the required protective relay calibration and functional tests. (The UDC may accept a certified test report in lieu of witnessing the tests.)
- (vii) The Generating Facility is wired, as best can be determined, in accordance with the electrical diagrams submitted to the UDC.
- (viii) The UDC shall, at the time of the site inspection, or prior thereto:
  - a. Install all appropriate metering is installed, if required.
  - b. Label all Utility equipment; and
  - c. Ensure that Generating Facility is properly incorporated onto UDC operating maps and identified as a backfeed source.

The UDC shall not have the right to fail a Site Inspection in the event the above requirements (metering, utility equipment labeling and identification of the GF on the operating maps) are not in place at the time of the Site Inspection.

- (o) Immediately following completion of the site inspection (and upon receipt of all final applicable signed interconnection documents) the UDC shall determine whether or not the Generating Facility meets all applicable requirements, and shall notify the Customer that:
  - (i) The Generating Facility appears to comply with all necessary requirements, and that it may be operated in parallel with the UDC's distribution system per the agreed terms and conditions. Within one (1) Business Day, following such notification the UDC shall provide the Customer with such notice in writing.
  - (ii) The Generating Facility has failed to meet one or more of the applicable requirements and that permission to parallel is denied. The UDC shall provide an explanation of the reason(s) for denial. If the abovementioned inspection or equipment testing is not satisfactory, the UDC shall have the right to disconnect and lock out the Generating Facility, and the Customer must re-schedule the site inspection with the UDC. The Customer may not operate in

parallel until it receives written approval from the UDC, and violation of this condition may result in immediate termination of electric service to the Customer.

- (p) In the event that the Generating Facility does not pass the initial UDC site inspection the Customer must correct any outstanding issues and re-schedule any site inspection, as required, with the UDC per step (m). A non-refundable one hundred dollar (\$100) fee will apply to any re-inspection conducted by the UDC.

If updated diagrams are required to reflect as-built conditions, the Customer must submit these to the UDC along with a thirty dollar (\$30) processing fee and the UDC will process and mail an amendment to the Interconnection Agreement within five (5) Business Days after receipt (and acceptance) of the revised diagrams for Customer review and signature.

- (q) Within one (1) Business Day following execution of the amended Agreement(s) and completion of any site re-inspection, if required, the UDC shall provide written notification to the Customer that the Generation Facility may be operated in parallel with the UDC's distribution system per the agreed terms and conditions.

If an Application for Interconnection, under the Fast Track Process, is denied because it does not meet one or more of the applicable requirements, the Application may be evaluated under the Study Process. Any processing fee submitted by the Customer under the Fast Track process shall be applied to the Study Process processing fee, and Customer will be responsible for submitting any balance due.

*This process was developed primarily by combining language from:*

- *New 2005 Arizona Draft Interconnection Rule Submitted By: Arizona Solar Energy Industry Association, Distributed Energy Association of Arizona, Greater Tucson Coalition for Solar Energy, Intermountain Combined Heat and Power Center, Intermountain Combined Heat and Power Initiative, Southwest Energy Efficiency Project, Vote Solar Initiative, and Western Resource Advocates (Submitted July 29, 2005), at Section 4.3 (with some modifications).*
- *Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Exhibit 3 (with some modifications).*

### **3. Study Process:**

The Study Process shall be used by a Customer proposing to interconnect its Generating Facility with the UDC's distribution system if the Generating Facility is larger than 1 MW but no larger than 10 MW, or if it is deemed that a Generating Facility project of less than 1 MW requires a study by the UDC.

The Study Process steps are as follows:

- (a) The Customer contacts the UDC for an interconnection information package and outlines the proposed project. The UDC forwards appropriate information to Customer within five (5) Business Days and provides a UDC contact name and telephone number.
- (b) (Optional) The Customer is strongly encouraged to contact and/or meet with the UDC at the conceptual stage of the project to discuss proposed installation/design options and proposed operation. A preliminary electrical one-line diagram would be very helpful at this stage. This step will ensure that:
  - (i) The Generating Facility project proceeds smoothly and in a timely manner.
  - (ii) The UDC and Customer understand upfront whether any special considerations, protective equipment or system modifications may be required, which could be initiated as soon as possible.
  - (iii) Applicable interconnect and contractual, study and protective requirements are properly understood and implemented.
- (c) If the Customer decides to proceed with the project, the Customer must complete the Interconnection Application (Application) and submit it to the UDC along with all supplemental information. (e.g. electrical diagrams, protective relaying and settings, site plan and plant location diagrams, etc.), including the anticipated start-up date for of the Generating Facility. A non-refundable processing fee of five hundred dollars (\$500) shall be submitted by the Customer along with the Application.
- (d) The UDC shall notify the Customer that it received the Interconnection Application within three (3) Business Days of receipt.
- (e) The UDC shall notify the Customer within ten (10) Business Days of receipt of the Interconnection Application whether it is complete or incomplete. If the Application is incomplete, the UDC shall advise the Customer what information or material is missing.
- (f) The Customer has twenty (20) Business Days after receipt of such notification to submit the required information and/or material, or to request an extension of time to provide such information and/or material. If the Customer does not provide the required information or a request for an extension of time within the deadline, the Interconnection Application shall be deemed withdrawn. The UDC shall notify the Customer within ten (10) Business Days, following receipt of the requested information, as to whether or not the application is complete.

(g) Following receipt of a complete Interconnection Application and all required supplemental information, or any modification thereto, and within twenty (20) Business Days after the UDC notifies the Customer that the Interconnection Application is complete, the UDC shall review the proposed interconnection information to determine whether the proposed Generation Facility design meets the applicable interconnection requirements. During this initial review, the UDC may perform limited studies at its cost to evaluate the proposed interconnection. This review shall result in one of the following determinations and Customer notifications:

- (i) The Generating Facility design as submitted appears to meet all of the applicable interconnection requirements and no further studies; special protective requirements or system modifications are required. In this case, the UDC shall notify the Customer that the Application is approved and that appropriate agreements will be prepared by the UDC and forwarded to the Customer for review and signature in accordance with step (k) below.
- (ii) The Generating Facility design does not meet the applicable interconnection requirements as proposed, or that additional information is needed from the Customer, because of one or more of the following conditions:
  - a. Modifications are needed to the proposed Generating Facility interconnection design.
  - b. Additional information or data (e.g. fault data) is needed from the Customer to complete the review/study.
  - c. Modifications are needed to the utility system.
  - d. Special protective requirements apply (e.g. transfer trip).
  - e. A determination has been made that an Interconnection Study (Study) will need to be conducted to further evaluate the feasibility of interconnecting the proposed generation system.

The UDC will provide the customer with an explanation of each of the applicable conditions identified above that will need to be resolved, along with any estimated costs and time frames, if applicable.

In the event that a Study is required, the UDC will provide the Customer with a non-binding, good faith estimate of the costs of such Study and an estimated time frame to complete the Study. The scope of the Study shall also be outlined and may include, but is not limited to, potential adverse impacts to the utility system (including fault duties, system loading, relay coordination, system stability and power flow) and potential modifications that would be needed to the Utility system and the Customer's system. The UDC



will also outline additional data that may be needed from the Customer to conduct the Study.

- f. The proposed Generating Facility design has failed to meet one or more of the applicable interconnection requirements and the review indicates that the Generating Facility could not be interconnected to the proposed distribution feeder in a safe or reliable manner, or that such interconnection would be cost prohibitive or impractical. In such a case, the UDC shall notify the Customer that the Application has been denied, and shall provide an explanation of the reason(s) for the denial.
- (h) (Optional) A scoping meeting will be held at this time if requested by the Customer or UDC. The UDC and the Customer will bring to the meeting personnel, including system engineers and other resources as may be reasonably required to accomplish the purpose of the meeting.
- (i) The Customer shall, within ten (10) Business Days following receipt of such UDC notification, or following the scoping meeting if held, notify the UDC as to whether or not it wishes to proceed with the project. If the Customer does not wish to proceed with the project, or does not notify the UDC of its intention within this time-frame, the Application shall be deemed withdrawn. If the Customer wishes to proceed with the project, then Customer shall within twenty (20) Business Days following receipt of the UDC notification, submit to the UDC:
  - (i) Required modifications to the proposed Generating Facility design if applicable.
  - (ii) Any additional information or data as requested.
  - (iii) If a study is not required:
    - a. Arrange with the UDC for the UDC to implement any required modifications to its system. Customer and UDC will agree in writing on the reimbursable costs, required deposit and time-frame(s) for such modifications.
    - b. Work with the UDC on the implementation of any special protective requirements that may apply. Customer and UDC will agree in writing on the reimbursable costs, required deposit and time-frame(s).
  - (iv) If a Study is required:
    - a. Submit to the UDC a written request to perform the Study.
    - b. Customer and UDC will agree in writing on reimbursable costs, required deposit and estimated time frames for the Study.
    - c. UDC will prepare and forward any applicable Study Agreement to Customer for review and signature, which will be executed prior to commencement of the Study.
    - d. Customer will forward to the UDC additional information that may be required to perform the Study.

(Note: If a Study is not required and the Customer submits modifications to the design, then upon submission of modifications by Customer to UDC, step (g) is re-initiated. A non-refundable one hundred dollar (\$100) processing fee shall be submitted along with every submission of modifications submitted under the Study Process Application).

If a Study is required, then the UDC completes the Study as agreed. If any additional information is required from the Customer during the study process then Customer will provide such information to the UDC as promptly as possible. Study time frames may need to be adjusted due to information pending.

Upon completion of the Study, UDC forwards to the Customer an invoice for the actual cost of the Study detailing any balance due or refundable, in accordance with the terms agreed upon. If any balance is due the UDC, then Customer forwards the balance due to UDC prior to UDC submission of completed Study to Customer. If any balance is due the Customer, then UDC shall promptly forward any refund due, along with the completed Study.

- (j) Following submission of the Study to the Customer, Customer reviews it and notifies the UDC within twenty (20) Business Days whether or not it wishes to proceed with the project:
  - (i) If Customer does not wish to proceed with the project then the Application is deemed withdrawn.
  - (ii) If Customer wishes to proceed with the project, Parties execute any applicable construction contract documents, and agree in writing to re-imbursable costs and time frame(s).
- (k) If the Generating Facility Interconnection Application meets all of the applicable interconnection requirements, and once all items identified in any Study have been resolved and agreed to (if applicable), then the UDC shall send to the Customer the appropriate agreements for review and signature.
- (l) After receiving the agreements (or revisions to any agreements), the Customer shall review, sign and return the agreements, along with evidence of insurance coverage if required, to the UDC at least five (5) Business Days prior scheduling the project UDC site inspection date.
- (m) The UDC, in conjunction with the Customer as necessary, will effect any distribution system modifications or special protective requirements that might be applicable in accordance with the agreed upon terms and time-frames.
- (n) The Customer completes the Generating Facility project and schedules the UDC site inspection. Customer shall provide the UDC with at least ten (10) Business Days notice to schedule the UDC site inspection and to witness the protective device tests. There will be no charge for the initial

site inspection by the UDC. The UDC may schedule metering replacement, if necessary, and labeling of utility equipment to occur at the same time.

- (o) The UDC performs the site inspection as arranged and verifies that the Generating Facility, as best as can be determined, is in compliance with all applicable interconnection and code requirements. At a minimum, the UDC shall verify the following:
  - (i) An electrical permit and/or clearance has been issued by the Authority Having Jurisdiction if required.
  - (ii) All Generating Facility equipment is properly labeled.
  - (iii) Generating Facility system layout is in accordance with the Plant Location and Site Plant(s) submitted to the UDC.
  - (iv) Generator nameplate ratings are consistent with the information submitted to the UDC.
  - (v) UDC has unimpeded access to the Disconnect Switch, and that the switch meets all requirements as specified herein.
  - (vi) UDC will witness the required protective relay calibration and functional tests. (The UDC may accept a certified test report in lieu of witnessing the tests.)
  - (vii) The Generating Facility is wired, as best as can be determined, in accordance with the electrical diagrams submitted to the UDC.
  - (viii) The UDC shall, at the time of the site inspection, or prior thereto:
    - a. Install all appropriate metering is installed, if required;
    - b. Label all utility equipment, and
    - c. Ensure that Generating Facility is properly incorporated onto UDC operating maps and identified as a backfeed source.

The UDC shall not have the right to fail a Site Inspection in the event the above requirements (metering, utility equipment labeling and identification of the GF on the operating maps) are not in place at the time of the Site Inspection.

- (p) Immediately following completion of the site inspection (and upon receipt of all final applicable signed interconnection documents) the UDC shall determine whether or not the Generating Facility meets all applicable requirements, and shall notify the Customer that:
  - (i) The Generating Facility appears to comply with all requirements, and that it may be operated in parallel with the UDC's distribution system per the agreed terms and conditions. Within one (1) Business Day, following such notification the UDC shall provide the Customer with such notice in writing.
  - (i) The Generating Facility has failed to meet one or more of the applicable requirements and that permission to parallel is denied. The UDC shall provide an explanation of the reason(s) for denial.

If the abovementioned inspection or equipment testing is not satisfactory, the UDC shall have the right to disconnect and lock out the Generating Facility, and the Customer must re-schedule the site inspection with the UDC. The Customer may not operate in parallel until it receives written approval from the UDC, and violation of this condition may result in immediate termination of electric service to the Customer.

- (q) In the event that the Generating Facility does not pass the initial UDC site inspection the Customer shall correct any outstanding issues and will re-schedule any site inspection, as required, with the UDC per step (n). A non-refundable one hundred dollar (\$100) fee will apply to any re-inspection conducted by the UDC.

If updated diagrams are required to reflect as-built conditions, the Customer shall submit these to the UDC along with a thirty dollar (\$30) processing fee and the UDC will process and mail an amendment to the Interconnection Agreement within five (5) Business Days after receipt (and acceptance) of the revised diagrams for Customer review and signature.

- (r) Within one (1) Business Day following execution of the amended Agreement(s) and completion of any site re-inspection, if required, the UDC shall provide written notification to the Customer that the Generating Facility may be operated in parallel with the UDC's distribution system per the agreed terms and conditions.

*This process was developed by APS in response to the ACC request. Base documents included:*

- *Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Exhibit 3 (with some modifications).*
- *Salt River Project's Interconnection Guidelines for Distributed Generation, December 2000*
- *the New 2005 Arizona Draft Interconnection Rule Submitted By: Arizona Solar Energy Industry Association, Distributed Energy Association of Arizona, Greater Tucson Coalition for Solar Energy, Intermountain Combined Heat and Power Center, Intermountain Combined Heat and Power Initiative, Southwest Energy Efficiency Project, Vote Solar Initiative, and Western Resource Advocates (Submitted July 29, 2005)*

#### **4. Documentation Requirements:**

Information below to be submitted, along with the Interconnection Application, for all projects and must be site specific regarding the information requested below, without extraneous information. All diagrams are to be professionally and neatly drawn. Free hand drawn and illegible diagrams will not be accepted by the UDC. All diagrams must include the

project name and street address including diagram revision numbers and dates.

Upon request, the UDC will provide Customer with sample Electrical Diagrams as well as a Plant Location Diagram and Site Plan that clearly indicate a typical the level of detail and the type of information that is required on the diagrams for a typical inverter-based system.

**(a) Electrical One-Line Diagram: (preferable size: 8 ½" x 11" or 11" x 17")**

Provide 4 sets. Diagram(s) must show generator ratings and connection(s) and all protective relaying and control equipment, as well as electric service entrance, Utility meter, connection point(s) of facility load(s), and all other major electrical components and associated wiring.

**(b) Electrical Three-Line Diagram: (preferable size: 8 ½" x 11" or 11" x 17")**

Provide 4 sets. Diagram(s) must show generator ratings and connection(s) and all protective relaying and control equipment, as well as electric service entrance, Utility meter, and include all neutral and ground conductors and connections. Point(s) of facility load(s) must be shown, as well as all other major electrical components and associated wiring.

**(c) AC & DC Control Schematics: (preferable size: 8 ½" x 11" or 11" x 17")**

Provide 4 sets for projects comprising rotating machinery only. Diagrams must show the detailed wiring of all protective relays and control functions, and include control power source and wiring.

**(d) Plant Location Diagram: (preferable size: 8 ½" x 11" or 11" x 17")**

Provide 4 sets. Diagrams must show major cross streets and plant location.

**(e) Site Plan: (preferable size: 8 ½" x 11" or 11" x 17")**

Provide 4 sets showing the arrangement of the major equipment, including the electric service entrance section and Utility meter, location of generator, interface equipment, Disconnect Switch and location of any lock-boxes, etc. Include building structure location and any walls, fences and gates etc, to clearly indicate unobstructed access to UDC equipment and Disconnect Switch.

**(f) Testing Company:**

Provide the name of the company that will do the protective relay bench testing and the trip circuit functional tests (not applicable to static inverters 10 kW or less) with built-in solid state protection certified to IEEE 929).

**(g) Point of Contact**

If the interconnection and start-up process is to be coordinated through a party other than the Customer, provide the name, company, address and phone number of that party with whom the Utility is to coordinate the interconnection.

*This language was primarily taken from Revision 3 of the Interconnection Requirements for Distributed Generation (dated 11/06/1*

**5. Designation of Utility Contact Persons:**

The UDC shall designate an employee or office from which information on the application process can be obtained through informal requests from the Customer presenting a proposed project for a specific site. The name, telephone number, and e-mail address of such contact employee or office shall be made available on the UDC's web site.

**II. Interconnection Technical and Operational Requirements**

**A. Design Considerations/Protective Equipment Requirements:**

**1. Design Considerations:**

Protection requirements are influenced by the size and characteristics of the parallel generator along with the nature and operational characteristics of the associated UDC system. Therefore, similar units connected to different lines could have different protection requirements based on varying load conditions, as well as on UDC feeder and transformer characteristics.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 7 (with some modifications).*

**(a) Synchronous Units:**

Synchronous generators are generally capable of supplying sustained current for faults on the UDC system. These units can also supply isolated Utility load providing the load is within the units' output capability, and must be prevented from energizing a de-energized line or section of the Utility system.

Automatic reclosing by the Utility may be either time-delayed or may be instantaneous. The Utility will specify the maximum allowable protective relay time settings for a particular proposed distributed generator installation. The Customer is responsible for ensuring generator separation prior to Utility circuit re-energization to prevent out-of-sync paralleling.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 7.1 (with some modifications).*

**(b) Induction Units:**

Induction Generating Facilities are basically induction motors that are mechanically driven above synchronous speed to produce electric power. These units do not have a separate excitation system and, as such, require that their output terminals be energized with AC voltage and supplied with reactive power to develop the magnetic flux. Induction Generating Facilities are therefore normally not capable of supplying sustained fault current into faults on the UDC system. Such units are generally not capable of supplying isolated load when separated from the UDC system; however, it is possible for an induction Generating Facility to become self-excited if a sufficient amount of capacitance exists at its output terminals. Under conditions of self-excitation, an induction Generating Facility will be capable of supplying isolated load, providing the load is within the units' output capability. In most cases when self-excitation occurs it will be accompanied by a sudden increase in terminal voltage. The UDC and its other customers must be protected from out-of-phase closing and over-voltages that can occur whenever an induction Generating Facility becomes self-excited. Induction units must therefore be designed to automatically separate from the UDC's system upon loss of UDC voltage and prior to reclosing of the UDC's feeder.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 7.2 (with some modifications).*

**(c) Static Inverters:**

Static inverters convert DC power to AC by means of electronic switching. Switching can be controlled by the AC voltage of the UDC's supply system (line-commutated) or by internal electronic circuitry (forced-commutated).

Line-commutated inverters are generally not capable of operating independently of the UDC's AC supply system and, as such, cannot normally supply fault current or isolated loads. Forced-commutated, or self-commutated, inverters are capable of supplying fault current and load independently of the AC supply system. Any forced-commutated inverter that is to be interconnected with the UDC must be specifically designed for that purpose, i.e. it must be designed to accommodate parallel interfacing and operation.

Static inverters must be designed to automatically separate from the Utility system upon loss of Utility voltage and prior to reclosing of the Utility feeder.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 7.3 (with some modifications).*

## **2. Protective Equipment Requirements (Technical Requirements):**

The requirements and specifications outlined in this section are applicable to all classes of distributed generation, unless otherwise specified. The minimum protection and safety devices and other requirements specified in the following sections are intended to provide protection for the UDC system, Utility workers, its other customers and the general public. They are not imposed to provide protection for the Customer's generation equipment or personnel; this is the sole responsibility of the Customer. These requirements are in addition to requirements outlined in other sections of these provisions.

With respect to the above protection objectives, it is necessary to disconnect the parallel generator when trouble occurs. This is to:

- ensure if a fault on the UDC system persists, the fault current supplied by the Customer's Generating Facility is interrupted;
- prevent the possibility of reclosing into an out-of-synch isolated system composed of the utility distribution system, or a section thereof, and the Customer's generator; and
- prevent reclosing into the Customer's Generating Facility that may be out of synchronization or stalled.

The protection requirements are minimal for smaller installations, but increase as the size of the Customer's generation increases. Small installations usually ensure that the Generating Facility is small compared with the magnitude of any load with which it might be isolated. Thus, for any fault on the UDC system, UDC protective devices will operate and normally isolate the Generating Facility with a large amount of load, causing voltage collapse and shutdown of the Generating Facility. For larger installations the probability of isolated operation is higher since the available generation may be sufficient to carry the entire load, or part thereof, of the local UDC circuit. In instances where the UDC system arrangement is such that it is possible that the generators will not always be isolated with comparatively large amounts of load, additional protection and generator shutdown schemes are required.

**The Customer is solely responsible for the protection of his equipment from automatic reclosing by the UDC.** The UDC normally applies automatic reclosing to overhead distribution circuits. When the UDC source breaker trips, the Customer must ensure that his generator is disconnected from the UDC circuit prior to automatic reclosure by the UDC. The automatic reclosing time on the Utility distribution feeder varies by Utility and from Utility feeder to feeder. Automatic reclosing out-of-sync with the Customer's generator may cause severe damage to Customer equipment and could also pose a serious hazard to Customer or UDC personnel.



*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 8 (with some modifications).*

**(a) General Technical Requirements:**

- (i) Customer is responsible for obtaining and maintaining all required permits and inspections indicating that the Customer's Generating Facility complies with all applicable codes, ordinances and statutes relating to safety and construction.
- (ii) Multiple generator connections on the same UDC service are permitted subject to UDC approval; however, a single Disconnect Switch for the facility will be required (normally located at the service entrance section).
- (iii) In the event that a generator, or aggregate of generators, are of sufficient size to carry the entire (minimum) load of the UDC's distribution feeder, or if a generator's size and physical location on a feeder is such that it could support an isolated (islanded) section of the feeder, then a transfer trip scheme may be required at the Customer's expense. If a transfer trip is required, a communication channel and telemetering may also be required. In certain instances, a dedicated UDC feeder may be required.
- (iv) For synchronous generators, the Customer shall ensure that any potential open points such as breakers, fused disconnect switches, etc, located between the Generating Facility breaker and UDC service are appropriately equipped with either (1) keyed or other suitable mechanical interlocks to prevent them from being inadvertently opened when the Generating Facility breaker is closed, or (2) contacts that will instantaneously trip the Generating Facility breaker if any such switch were opened while the generator breaker was closed.

The intent of the above is to prevent the opening and subsequent (inadvertent) re-closing of such a breaker or switch onto an unsynchronized generator.

- (v) Customer shall ensure that the design and installation of electric meter(s) is such that the meter(s) are located on the UDC-side of the Generating Facility breaker on a normally energized bus. Electronic meters are not designed to be de-energized for any length of time.
- (vi) The Customer is responsible for the design, installation, operation and maintenance of all equipment on the Customer's side of the Point of Interconnection. It is also the Customer's responsibility to

submit specifications and detailed plans as specified in this manual for the installation to the UDC for review and written approval prior to their purchase and installation. Written approval by UDC does not indicate acceptance by other authorities.

- (vii) UDC will not install or maintain any lines or equipment on a Customer's side of the Point of Interconnection, except it may install its meter and some research equipment. Only authorized UDC employees (with credentials to identify their company affiliation) may make and energize the service connection between the UDC system and the Customer's service entrance conductors.
- (viii) Normally, the interconnection will be arranged to accept only one type of standard service at one Point of Interconnection. If a Customer's Generating Facility requires a special type of service, or if sales to UDC will be at a different voltage level, the services will only be provided according to additional specific terms that are outlined in the Electric Supply/Purchase Agreement, applicable rate schedules, or other terms and conditions governing the service.
- (ix) The minimum protective and safety devices (relays, circuit breakers, disconnect switches, etc.) specified in these provisions must be installed and placed into service before allowing parallel operation of the Customer's Generating Facilities with the UDC's system. The purpose of these devices is to isolate the Customer's Generating Facility equipment from the UDC's system whenever faults or disturbances occur and for maintenance purposes. Modifications to the UDC electrical system configuration or protective equipment may also be required at the expense of the Customer in order to accommodate parallel generation.
- (x) The UDC will not assume any responsibility for the protection of the Customer's Generating Facility, or of any other portion of the Customer's electrical equipment. The Customer is fully and solely responsible for protecting his equipment in a manner to prevent any faults or other disturbances from damaging the Customer's equipment.
- (xi) The Customer must obtain all required permits and inspections indicating that the Customer's Generating Facility complies with local and other applicable safety codes. The Utility can disallow the interconnection of a Customer's generating facility and deny an Interconnection Application if, upon review of the Customer's design or facility, it determines that the proposed design or facility is not in compliance with applicable safety codes, or is such that it could constitute a potentially unsafe or hazardous condition.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Sections 8.1 as well as the Arizona Public Service*

*Company's Interconnection Requirements for Distributed Generation  
(with some modifications).*

**(b) Disconnect Switch:**

The Customer shall install and maintain a visible open, manually-operated load-break disconnect switch ("Disconnect Switch") capable of being locked in a visibly "open" position by a standard UDC padlock with a 3/8" shank that will completely isolate all ungrounded conductors of the Customer's Generating Facility from the UDC's system. For multi-phase systems, the switch shall be gang-operated.

The Disconnect Switch blades, jaws and the air-gap between them shall all be clearly visible when the switch is in the "open" position. It is not acceptable to have any of the "visible open" components obscured by the switch case or an arc-shield, etc. Only switches specifically designed to provide a true "visible open" are acceptable, and shall not be a fused, unless expressly agreed to by the UDC. The UDC shall have the right to lock open the Disconnect Switch without notice to the Customer when interconnected operation of the Customer's Generating Facility with the UDC's system could adversely affect UDC's system or endanger life or property, or upon termination of the Interconnect Agreement.

The Disconnect Switch shall be installed in a place so as to provide easy, unrestricted and unimpeded accessibility to UDC personnel on a 24-hour basis and will normally be required to be installed at the Customer's electrical service entrance section; however, it may be located in the immediate vicinity of the Generating Facility, subject to UDC approval. The Disconnect Switch will be placed under the operational jurisdiction of the UDC, and the cover of such switch will normally be locked closed with a standard 3/8" shank UDC padlock.

The Disconnect Switch shall be a stand-alone device, and electrical conductors entering into and exiting from the Disconnect Switch shall not be routed in the same conduit or raceway.

The Disconnect Switch must be rated for the voltage and current requirements of the Generating Facility, and must be listed and conform to all applicable UL, ANSI and IEEE standards. The switch shall be installed in accordance with the National Electric Code (NEC) requirements, and the switch enclosure shall be properly grounded via a factory provided grounding lug or an appropriately UL listed grounding lug.

Under no circumstances shall the disconnect switch enclosure be used as a conduit or raceway for any conductors other than those phase conductors being switched and the associated grounded conductor (neutral) and grounding conductor (ground).

In cases where the Disconnect Switch will be installed on a line at a voltage above 500V, the UDC has specific grounding requirements that will need to be incorporated into the Disconnect Switch. Under certain circumstances the UDC may allow the Customer to install a rack-out breaker, along with a racking tool and grounding breaker, in lieu of a Disconnect Switch. In these cases, the UDC will work with the Customer to determine the best option and ensure that the safety requirements are met.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 8.2 (with some modifications).*

**(c) Dedicated Transformer:**

Customer generators with a combined total nameplate power rating of over 10 kW, may be required to be isolated from other customers fed off the same Utility transformer by a dedicated power transformer connecting to the Utility distribution feeder. The primary purpose of the dedicated transformer is to ensure that (a) the generator cannot become isolated at the secondary voltage level with a small amount of other-customer load, and (b) the generator does not contribute any significant fault current to other customers' electrical systems. It also helps to confine any voltage fluctuation or harmonics produced by the generator to the Customer's own system. The Utility will specify the transformer winding connections and any grounding requirements based on the specific customer site location.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 8.3 (with some modifications).*

**(d) Voltage Requirements:**

Customer generating equipment must deliver at the Point of Interconnection, 60 Hertz, either single or three-phase power at one standard utility voltage as may be selected by the Customer subject to availability at the premises.

**(e) Labeling Requirements:**

- (i) **General Requirements:** The Customer shall conform to the NEC for labeling of generation equipment, switches, breakers, etc. The UDC will assume responsibility for labeling any UDC equipment.

- (ii) **Disconnect Switch:** The Customer shall label the Disconnect Switch "Generator Utility Disconnect Switch" (or "Photovoltaic Inverter, Wind Turbine, etc, Utility Disconnect Switch", as the case may be) by means of a permanently attached weatherproof placard with clearly visible and permanent letters.
- (iii) **Service Entrance:** A sign shall be placed at the service entrance indicating type and location of onsite emergency power sources, legally required standby power sources, and onsite optional standby power sources, as defined by the NEC.

The NEC also requires a permanent directory, denoting all electrical power sources on or in the premises, which shall be installed at each service equipment location and at locations of all electric power production sources capable of being interconnected. Installations with large numbers of power production sources shall be permitted to be designed by groups.

- (iv) **Breaker Panels:** The Customer is responsible for ensuring that all electrical devices such as panel boxes, etc., which are or can be back-fed by the Customer's generator(s) are clearly identified/labeled as such in accordance with the requirements of the National Electrical Code. UDC will assume responsibility for labeling any Utility equipment.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 8.6 (with some modifications).*

(f) Protective Requirements:

(i) **General Requirements:**

- a. The Customer shall be solely responsible for properly protecting and synchronizing his generator(s) with the UDC's system
- b. Customer facility's shall include an automatic interrupting device listed with a nationally recognized testing laboratory, and is rated to interrupt available fault (short circuit) current. The interrupting device shall be tripped, as a minimum, by all protective devices required herein.
- c. Inherent characteristics of induction disk type voltage and frequency relays render their use unsuitable for some Generating Facility interface protection applications. Therefore, relays with definite level and timing characteristics (e.g., solid state type relays) will be necessary to meet the minimum requirements established herein.

- d. For generator classes II and above (>50 kW), utilizing discreet relays, separate and independent voltage and frequency relays and associated trip paths are required. This is to ensure a redundant trip function in the event of a single relay failure or out-of-tolerance condition. It is acceptable however, for the over/under voltage functions to be integrated into a single o/u voltage relay, and for the over/under frequency functions to be integral to a single o/u frequency relay. Protective relays on microprocessor based devices may be used provided that the required functionality described herein is demonstrated.
- e. For generator protective schemes that utilize microprocessor based, multi-function relays, one of the following requirements must be met:
  - (1) Protective relay failure will not only alarm but will also trip the Generating Facility breaker/contactors.
  - (2) If a relay failure alarms, but does not trip the Generating Facility breaker, then additional relaying which meets the requirements stated herein for each class must be provided.
- f. With the addition of generation at a Customer's site, the ground fault current magnitude might increase to the level where the grounding grid is insufficient to protect personnel from step or touch potentials. Therefore, a study may be required to ensure the adequacy of the Customer's grounding grid to keep the step and touch potentials at a safe level.
- g. The Customer shall ensure that the Generating Facility protective relaying and controls are adequately protected from electrical surges that may result from lightning, UDC switching or electrical faults.
- h. The generator protective scheme shall be of a fail-safe design such that loss of the protection scheme control power will immediately cause the generator breaker to open.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 8.7.1 (with some modifications).*

(ii) Generating Facility Class Protective Requirements:

**a. Class I (Single or Three Phase: 50 kW or less)**

- (1) The minimum protection required is an under-voltage contactor.

- (2) For all synchronous Generating Facilities and forced commutated inverters, a synchronizing scheme, either manual with sync check relay, or an automatic synchronizer is required.

**b. Class II (Three Phase: 51-300 kW)**

- (1) Protection for overvoltage, undervoltage, overfrequency, and underfrequency is required.
- (2) For all synchronous generators and forced commutated inverters, either a manual or automatic synchronizing scheme is required.
- (3) For installations interconnected to the UDC through a transformer with connections that will not supply current to a ground fault on the UDC system, a special ground fault detection scheme may be necessary.
- (4) Other equipment such as supervisory control and alarms, telemetering and associated communications channels may be necessary. This is especially the case when (a) the generator, or an aggregate of generators is large relative to the minimum load on a feeder or sectionalized portion of the feeder, or (b) the Generating Facility is remotely controlled by, or dispatched by the UDC.

**c. Class III (Three Phase: 301-5,000 kW)**

- (1) For this class of installation, Utility grade protection devices and equipment will be required.
- (2) Protection for overvoltage, undervoltage, overfrequency, and underfrequency is required.
- (3) For all synchronous generators and forced commutated inverters, either a manual or automatic synchronizing scheme is required.
- (4) For installations interconnected to the UDC through a transformer with connections that will not supply current to a ground fault on the UDC system, a special ground fault detection scheme may be necessary.
- (5) Other equipment such as supervisory control and alarms, telemetering and associated communications channels may be necessary. This is especially the case when (a) the generator, or an aggregate of generators is large relative to the minimum load on a feeder or sectionalized portion of the feeder, or (b) the Generating Facility is remotely controlled by, or dispatched by the UDC.

**d. Class IV (Three Phase: Greater than 5,000 kW)**

- (1) For this class of installation, Utility-grade protective devices and equipment will be required.
- (2) Protection for overvoltage, undervoltage, overfrequency, and underfrequency is required.
- (3) For all synchronous Generating Facilities and forced commutated inverters, either a manual or automatic synchronizing scheme is required.
- (4) A ground time overcurrent and instantaneous overcurrent relay, or for installations interconnected to the UDC through a transformer with connections that will not supply current to a ground fault on the UDC system, a ground fault detection scheme is required.
- (5) The following relays are also required:
  - Voltage-controlled time overcurrent relays, one per phase
  - Negative sequence time overcurrent relay
  - Over excitation relay
  - Loss of excitation relay
- (6) Other equipment such as supervisory control and alarms, telemetering and associated communications channels may be necessary. This is especially the case when (a) the generator, or an aggregate of generators is large relative to the minimum load on a feeder or sectionalized portion of the feeder, or (b) the Generating Facility is remotely controlled by, or dispatched by the UDC.

The minimum protective relaying requirements for parallel operation of distributed generation are summarized in the following table:



### Summary of Minimum Protective Relaying Requirements

	Induction Generator/ Line Commutated Inverter	Synchronous Generator/ Forced Commutated Inverter
Class I 50 kW or less	Undervoltage contactor	Undervoltage contactor Synchronizing
Class II 51 to 300 kW	Overvoltage, Undervoltage Overfrequency, Underfrequency	Overvoltage, Undervoltage Overfrequency, Underfrequency Synchronizing
Class III 301 to 5,000 kW	Overvoltage, Undervoltage Overfrequency, Underfrequency	Overvoltage, Undervoltage Overfrequency, Underfrequency Synchronizing
Class IV Greater than 5,000 kW	No induction generators of this size anticipated	Overvoltage, Undervoltage Overfrequency, Underfrequency Synchronizing Ground Time Overcurrent Ground Instantaneous Overcurrent Voltage-controlled Time Overcurrent Loss of Excitation Overexcitation Negative Sequence Time Overcurrent

**(i) Relay Settings**

Voltage and frequency relays needed for minimum interface protection for all classes will have setting limits as specified by the serving Utility. The following table lists for general informational purposes, currently available settings for APS, SRP, TEP and SSVEC, and may be updated from time to time. The Customer should verify with the serving Utility prior to designing/installing a GF.

**MINIMUM UTILITY PROTECTIVE RELAY SETTINGS AND RE-CLOSING  
PRACTICES LAST UPDATE NOVEMBER, 1999**

<b>SETTING TYPE</b>	<b>APS</b>	<b>SRP</b>	<b>TEP</b>	<b>SSVEC</b>
Over-frequency Time delay	62 Hertz 1 Second	[1]	61.1 Hz 0.1 Seconds	60.5 Hz 0.1 Seconds
Under-frequency Time delay [2]	58 Hertz 1 Second	[1]	58.9 Hz 0.1 Seconds	59.5 Hz 0.1 Seconds
Over-voltage Time Delay	120% 1 Second	120% 0 Seconds	105% 0 Seconds	110% 1 Seconds
Under-voltage Time Delay	80% 1 Second	90% [3]	95% 0 Seconds	90% 1 Second
Re-closing, first shot [4]	2 or 5 Seconds	Instantaneous	Instantaneous	1 to 2 Seconds [6]
Re-closing, second shot [4]	2 or 5 Seconds	15 Seconds	15 to 30 Seconds [5]	1 to 2 Seconds
Re-closing, third shot [4]	5 Seconds		165 Seconds	1 to 5 Seconds
Re-closing, fourth shot [4]	5 Seconds			

**Notes:**

- [1] Guidelines do not specify a setting or time delay; they say, "trip the circuit breaker when the frequency varies from the nominal 60 Hz."
- [2] If generator is considered a WSCC generator, the under-frequency setting might be different to comply with WSCC guidelines.
- [3] Per SRP guidelines, "Set the time delay (typically 3 to 5 seconds at zero voltage) to allow for motor starting and to coordinate with line protection devices."
- [4] Times are for typical overhead/residential type feeders (not necessarily line reclosers), and are the time delay from the trip to the next reclosure. Actual number of re-close shots on a particular feeder may vary.
- [5] Varies based on type of reclosing utilized.
- [6] Reclosing on first shot transmission, and hence distribution, is instantaneous.
- [7] Protective relay setting as specified in IEEE1547 under/over voltage, and under/over frequency for induction and synchronous generators, will meet the UDC relay setting requirements in the above table. Inverters certified to meeting the under/over voltage, under/over frequency and anti-islanding provisions of IEEE 929 will meet the UDC relay setting requirements.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 8.7.3 (with some modifications).*

## **B. Operational Requirements**

Customer shall exercise reasonable care to assure that the electrical characteristics of its load and generating equipment will maintain the serving Utility's normal power quality requirements. Any deviation from sine wave form or unusual short interval fluctuations in power demand or production shall not be such as to result in impairment of service to other customers or in interference with operation of computer, telephone, television or other communication systems or facilities. Those power quality items will generally include the following:

- Power Quality
- Current Imbalance
- Harmonics
- Voltage Flicker

The table below lists for general informational purposes currently available requirements for APS, SRP, TEP and SSVEC, and may be updated from time to time. The Customer should verify actual requirements with the serving Utility prior to designing/installing a GF.

**LOAD CHARACTERISTICS FOR  
ARIZONA UTILITIES  
LAST UPDATE NOVEMBER, 1999**

SETTING TYPE	APS	SRP	TEP	SSVEC
Power Factor [1]	90% lag 0% lead	85% lag to 90% lead	No Penalties	90% lag 90% lead
Phase Current Imbalance	10%	5%	[3]	10%
Voltage Characteristics	ANSI C84.1	[2]	ANSI C84.1	ANSI C84.1
Sine Wave Form	IEEE 519	[2]	IEEE 519	IEEE 519
Harmonics	IEEE 519 [2]	IEEE 519 [2]	IEEE 519 [2]	IEEE 519 [2]
Voltage Flicker	IEEE 519 [3]	IEEE 519 [3]	IEEE 519 [3]	IEEE 519 [3]

**Notes:**

- [1] Provision to substitute kVA for kW in rates but not generally applied.
- [2] Load characteristics shall not impair service to other customers.
- [3] Need to consult Utility.

*This language was generally taken from Arizona Public Service Company's Interconnection Requirements for Distributed Generation at Section 8.4 (with some modifications).*

**1. Network & Non-network items:**

*The requirements for interconnecting generating facilities to secondary network systems are different than those for interconnections to radial systems. In the secondary network system, there are technical requirements to be considered particularly with the design and operational aspects of network protectors that are not required on a radial system. The IEEE P1547.6 – Draft Recommended Practice for Interconnection Distributed Resources with Electric Power Systems Distribution Secondary Networks is presently under development.*

*Due to the lack of technical information, clear guidelines and the complexities with protective schemes used in the networked systems, APS recommends prohibiting any connection of Distributed Resources with network systems until clear standards and/or guidelines are established. Even with clear guidelines established, Utility companies will still need to study each project on a case by case basis to allow for a safe and reliable interconnection of these generating facilities to their secondary network systems.*

**C. Testing and Commissioning:**

1. Following the Utility approval of the Customer's proposed interconnection equipment and protective devices as specified herein, the Customer shall, at a minimum, have all specified interface equipment, shutdown and associated protective devices field tested and calibrated at the time of installation by qualified personnel and shall also perform functional trip testing of these relays and associated generator or inverter breaker. Calibration shall include on-site testing of trip setpoints and timing characteristics of the protective functions as required herein. Functional testing must demonstrate that each protective relay or device trip function as required herein, upon a (simulated) out of tolerance input signal will trip the generator breaker, and shall also include a simulated loss of control power to demonstrate that the generator breaker or contactor will open.

A trip timing test (simulated loss of voltage) will suffice for static inverters rated 50kW or less.

2. The Customer shall provide UDC with a copy of calibration and functional test results. Customer must also notify UDC at least ten (10) working days in advance that such tests are to be performed and allow UDC personnel to witness such tests and/or conduct additional startup tests if necessary.
3. The Customer will be required to have a signed Interconnect Agreement with the UDC, and will need to provide UDC with a copy of the insurance certificate, as applicable, prior to electrically paralleling the Generating Facility with the UDC's system.

4. The Customer shall not commence interconnected operation of its Generating Facility until the installation has been inspected by an authorized UDC representative and final written approval is received from the UDC to commence interconnected operation, which approval shall not be unreasonably withheld. The Customer shall give the UDC at least ten (10) working days prior to notice of when initial startup is to begin. The UDC will have the right to have a representative present during initial energizing and testing of the Customer's system.
5. The Customer shall have all protective devices tested by a qualified test personnel at the time of installation, prior to initial interconnection, and at intervals not to exceed four (4) years by qualified test personnel. The Customer shall (i) notify the UDC as to when such tests are to be performed at least five (5) working days prior to such tests and allow UDC personnel to witness the test, and (ii) provide the UDC with a certified copy of the test results for all rotating machinery and inverters not certified in accordance with this document.
6. The Customer will allow the UDC and its authorized agents access to the protective relaying and control facilities to conduct whatever startup or periodic tests the UDC deems necessary. The UDC will provide the Customer with advance notice of such tests, so that the Customer's representatives may be in attendance when such tests are performed.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 10 (with some modifications).*

#### **D. Meter Installations:**

The requirements of this section are applicable to Customers that either purchase power from, or sell or deliver energy to the UDC (QF Generating Facilities as defined under PURPA).

The Customer must provide and install at Customer's expense, and in accordance with UDC service standards, meter sockets and metering cabinets in a suitable location.

Upon interconnection of a Generating Facility with the UDC it is normally necessary for the UDC to replace the existing site utility billing meter with an electronic meter that will need to be physically accessed by UDC personnel on a monthly basis. Customer shall ensure that UDC personnel have unrestricted and unimpeded access to the meter.

The UDC will furnish, own, install and maintain all meters that register the sales of power to, and the purchase of energy from the Customer. The responsibility

for the costs of providing and maintaining the required meters will be outlined in the applicable rate tariff, or specified in the Electric Supply/ Purchase Agreement.

The requirements for electric metering are specified in the serving UDC's Electric Service Requirements document. UDC tariffs and schedules (on file with the Arizona Corporation Commission for regulated Arizona electric utilities) govern the applicable rates and requirements. Facilities with a higher capacities not covered in specific rates and schedules will be considered on an individual basis.

*This language was generally taken from Arizona Public Service Company's Interconnection Requirements for Distributed Generation at Section 9 (with some modifications).*

**E. Maintenance Requirements:**

1. The Customer shall be responsible for operating and maintaining the Generator Facility in accordance with the requirements of all applicable safety and electrical codes, laws and governmental agencies having jurisdiction.
2. The Customer shall protect, operate and maintain the Generating Facility in accordance with those practices and methods, as they are changed from time-to-time, which are commonly used in prudent engineering and electric Utility operations and shall operate and maintain the Generating Facility lawfully in a safe manner and non-hazardous condition.
3. In the event the UDC, or its authorized agents, lock open the Disconnect Switch, the Customer shall not remove or tamper with such lock.
4. The UDC will be allowed to install on the Customer's premises any instrumentation equipment for research purposes. Such equipment shall be owned, furnished, installed and maintained by the UDC.
5. The UDC (including its employees, agents and representatives) shall have the right to enter the Customer's premises to (a) inspect the Customer's generating facility, protective devices, and to read or test instrumentation equipment that the UDC may install, provided that as reasonably as possible, notice is given to the Customer prior to entering its premises; (b) maintain or repair the UDC's equipment; (c) disconnect the Generating Facility without notice if, in the UDC's opinion, a hazardous condition exists and such immediate action is necessary to protect persons, UDC facilities or other customers' or third parties' property and facilities from damage or interference caused by the Customer's Generating Facility, or improperly operating protective devices; (d) open the Disconnect Switch without notice if an operating clearance is required by UDC personnel.
6. When it is necessary for the UDC to open the disconnect switch, UDC personnel will not normally re-close the switch. It will normally be the



Customer's responsibility to re-close the switch after ensuring that all generation sources that could potentially be energizing the Customer's side of the switch are off, so as to eliminate any possibility of re-closing the UDC grid onto an out-of-sync generator.

However, UDC personnel may, without liability, re-close the Disconnect Switch, provided that (a) Customer requests, and agrees to allow, the UDC to re-close the switch, following the release of a UDC clearance or hold tag, and (b) there are means provided to conveniently allow UDC personnel to verify that the Customer side of the Disconnect switch is not energized.

7. Upon termination of the Interconnect Agreement, the Customer shall be responsible for ensuring that the Disconnect Switch is immediately opened, and that the electric conductors connecting the Customer's Generating Facilities to the Disconnect Switch are lifted and permanently removed, so as to preclude any possibility of interconnected operation in the future. The UDC reserves the right to inspect the Customer's facility to verify that the Generating Facility is permanently disconnected.

*This language was generally taken from Revision 3 of the Arizona State Draft Interconnection Requirements for Distributed Generation (submitted 11/30/99), at Section 11 (with some modifications).*

**APPENDIX A**

**INTERCONNECTION APPLICATION**

Complete the attached Interconnection Application and Equipment Information Form and prepare all required Supplementary Information listed at the back of this Application. Include the appropriate processing fee with this Application and send to:

(UDC Contact) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone: \_\_\_\_\_

INTERCONNECTION APPLICATION AND EQUIPMENT INFORMATION FORM

**SITE AND CUSTOMER INFORMATION** (Complete all items)

Customer Full Name \_\_\_\_\_

Company Name (if applicable) \_\_\_\_\_

Generating Facility Address \_\_\_\_\_

Customer Mailing Address \_\_\_\_\_

Telephone \_\_\_\_\_ E-mail \_\_\_\_\_

(UDC) Account Number \_\_\_\_\_ (UDC) Meter No \_\_\_\_\_

**PROPOSED OPERATION** (Answer all questions)

- A. Does the Generation Facility plan on selling any excess power generated back to the UDC? (Yes or No) \_\_\_\_\_. If Yes, is the Generation Facility a Qualifying Facility (QF) as defined in the Definitions section of the Interconnection requirements document? (Yes or No) \_\_\_\_\_
- B. Does the Generation Facility plan to sell excess power (sale for resale) to a third party other than the UDC? (Yes or No) \_\_\_\_\_
- C. Provide the anticipated project startup date: \_\_\_\_\_
- D. Is access to the Disconnect Switch and Electric Meter by UDC personnel in anyway restricted or impeded (e.g. fences, locks, gates, walls, animals, etc.)? (Yes or No) \_\_\_\_\_
- E. If the interconnection process is to be coordinated by a Party other than the Customer, complete the following:

Name: \_\_\_\_\_ Company: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

Phone: \_\_\_\_\_ E-mail: \_\_\_\_\_

- F. Application submitted under: \_\_\_\_\_ 10 kW Inverter Process  
\_\_\_\_\_ Fast Track Process  
\_\_\_\_\_ Study Process

Customer Signature \_\_\_\_\_ Date \_\_\_\_\_

### GENERATOR INFORMATION

(Complete for rotating generators only)

- A. Manufacturer \_\_\_\_\_
- B. Type (Synchronous, Induction, D.C.) \_\_\_\_\_
- C. Nameplate rating  
Voltage \_\_\_\_\_ kW \_\_\_\_\_  
Power Factor \_\_\_\_\_ Frequency \_\_\_\_\_  
Model No. \_\_\_\_\_ Single or Three Phase \_\_\_\_\_
- D. Type of Excitation System (Self or Separate) \_\_\_\_\_
- E. Generator Electrical Characteristics (on the machine base, for Class 2 and above)  
Synchronous Reactance ( $X_d$ ) \_\_\_\_\_  
Transient Reactance ( $X'_d$ ) \_\_\_\_\_  
Subtransient Reactance ( $X''_d$ ) \_\_\_\_\_  
Zero sequence reactance ( $X_0$ ) \_\_\_\_\_  
Negative sequence reactance ( $X_2$ ) \_\_\_\_\_
- F. Number of Units \_\_\_\_\_

### PRIME MOVER

(Complete for rotating machinery only)

- Manufacturer \_\_\_\_\_
- B. Manufacturer's Reference Number \_\_\_\_\_
- C. Energy Source (Natural Gas, Steam, etc.) \_\_\_\_\_

### INTERFACE EQUIPMENT

(Complete for rotating machinery only)

- A. Synchronizer for Synchronous Generator:  
Manufacturer \_\_\_\_\_  
Manufacturer's Reference Number \_\_\_\_\_  
Automatic or Manual Synchronizer \_\_\_\_\_
- B. Inverter for DC generator:  
Manufacturer \_\_\_\_\_  
Manufacturer's Reference Number \_\_\_\_\_  
Line or Self Commutated Inverter \_\_\_\_\_  
No. of Units \_\_\_\_\_

**PROTECTIVE RELAY INFORMATION**

(Complete all applicable items; attach a separate sheet if necessary. It is only necessary to complete items D and F below for static inverters not listed to UL1741 or not certified to IEEE929.)

A. Manufacturer's Name for each Protective Device \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

B. Manufacturer's Reference Number for each Protective Device \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

C. Range of Available Settings for each Protective Device \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

D. Proposed Settings (trip setpoint and time) for each Protective Device \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

E. Ratios of associated current transformer. If multi-ratio, state the available ratios and which ratio will be used \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

F. Describe operation for tripping of the interface or generator circuit breaker for both  
Utility voltage outage \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Utility short circuit (three phase and single phase to ground) \_\_\_\_\_

**STATIC INVERTER**

(Complete for DC to AC Inverters only)

- A. Manufacturer \_\_\_\_\_ Model No. \_\_\_\_\_
- B. Terminal Voltage \_\_\_\_\_ Single, Split or Three Phase \_\_\_\_\_
- C. Nameplate output (AC) kW \_\_\_\_\_ No. of Units \_\_\_\_\_
- D. Line or Self Commutated \_\_\_\_\_
- E. Total System kW Output \_\_\_\_\_
- F. Energy or Fuel Source \_\_\_\_\_
- G. Listed to UL1741? (Yes or No) \_\_\_\_\_
- H. Certified to IEEE929? (Yes or No) \_\_\_\_\_
- I. If inverter is not certified to IEEE929, provide proposed setting (trip setpoint and time) for each protective function:
- Under/over voltage \_\_\_\_\_
- Under/over frequency \_\_\_\_\_

## SUPPLEMENTARY INFORMATION

Information below to be submitted, along with the Interconnection Application, for all projects and must be site specific regarding the information requested below, without extraneous information. All diagrams are to be professionally and neatly drawn. Free hand drawn and illegible diagrams will not be accepted by the UDC. All diagrams must include the project name and street address including diagram revision numbers and dates.

Upon request, the UDC will provide Customer with sample Electrical Diagrams as well as a Plant Location Diagram and Site Plan that clearly indicate a typical the level of detail and the type of information that is required on the diagrams for a typical inverter-based system.

**(a) Electrical One-Line Diagram: (preferable size: 8 ½" x 11" or 11" x 17")**

Provide 4 sets. Diagram(s) must show generator ratings and connection(s) and all protective relaying and control equipment, as well as electric service entrance, Utility meter, connection point(s) of facility load(s), and all other major electrical components and associated wiring.

**(b) Electrical Three-Line Diagram: (preferable size: 8 ½" x 11" or 11" x 17")**

Provide 4 sets. Diagram(s) must show generator ratings and connection(s) and all protective relaying and control equipment, as well as electric service entrance, Utility meter, and include all neutral and ground conductors and connections. Point(s) of facility load(s) must be shown, as well as all other major electrical components and associated wiring.

**(c) AC & DC Control Schematics: (preferable size: 8 ½" x 11" or 11" x 17")**

Provide 4 sets for projects comprising rotating machinery only. Diagrams must show the detailed wiring of all protective relays and control functions, and include control power source and wiring.

**(d) Plant Location Diagram: (preferable size: 8 ½" x 11" or 11" x 17")**

Provide 4 sets. Diagrams must show major cross streets and plant location.

**(e) Site Plan: (preferable size: 8 ½" x 11" or 11" x 17")**

Provide 4 sets showing the arrangement of the major equipment, including the electric service entrance section and Utility meter, location of generator, interface equipment, Disconnect Switch and location of any lock-boxes, etc. Include building structure location and any walls, fences and gates etc, to clearly indicate unobstructed access to UDC equipment and Disconnect Switch.

**(f) Testing Company:**

Provide the name of the company that will do the protective relay bench testing and the trip circuit functional tests (not applicable to static inverters 10 kW or less) with built-in solid state protection certified to IEEE 929).

**(g) Point of Contact**

If the interconnection and start-up process is to be coordinated through a party other than the Customer, provide the name, company, address and phone number of that party with whom the Utility is to coordinate the interconnection.



SAMPLE INTERCONNECTION AGREEMENT

AGREEMENT FOR THE INTERCONNECTION  
OF CUSTOMER'S GENERATION  
FACILITY TO THE UDC DISTRIBUTION SYSTEM  
BETWEEN  
(UTILITY DISTRIBUTION COMPANY)  
AND  
(CUSTOMER)

UDC AGREEMENT NO. \_\_\_\_\_

AGREEMENT FOR THE INTERCONNECTION  
OF CUSTOMER'S GENERATION FACILITY  
TO THE UDC DISTRIBUTION SYSTEM  
BETWEEN  
(UTILITY DISTRIBUTION COMPANY)  
AND  
(CUSTOMER)

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## APPENDICES

### APPENDIX A:

ELECTRICAL ONE-LINE AND ELECTRICAL THREE-LINE DIAGRAMS

### APPENDIX B:

MAP OF PLANT LOCATION AND SITE PLAN

AGREEMENT FOR THE INTERCONNECTION  
OF CUSTOMER'S GENERATION FACILITY  
TO THE UDC DISTRIBUTION SYSTEM  
BETWEEN  
(UTILITY DISTRIBUTION COMPANY)  
AND  
(CUSTOMER)

1. PARTIES

This Agreement for the Interconnection of Customer's Generation Facility to the UDC Distribution System (hereinafter called "Agreement") is entered into as of the \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, (the "Effective Date") by and between (UTILITY DISTRIBUTION COMPANY), an Arizona Corporation (hereinafter called "UDC") and (CUSTOMER), (hereinafter called "Customer"). UDC and Customer are hereinafter sometimes referred to individually as "Party" and collectively as "Parties".

2. RECITALS

This Agreement is entered into in respect to the following facts and considerations, all of which are considered to be an essential part of the terms and conditions, which follow:

2.1 Customer intends to invest in, construct, own, maintain and operate a Generating Facility ("GF"), which will be operated in electrical parallel with UDC's electric distribution system.

2.2 The GF shall be permanently located at \_\_\_\_\_ (the "Property"), and shall be ready to operate in electrical parallel on or about \_\_\_\_\_.

2.3 The specifications of the GF are described as follows:

Type: \_\_\_\_\_

Fuel or Energy Source: \_\_\_\_\_

Unit Nameplate Output Rating: \_\_\_\_\_

Total Nameplate Output of all Units: \_\_\_\_\_

2.4 UDC and Customer intend to interconnect their respective facilities and systems in order that Customer may operate it's GF in electrical parallel with UDC's distribution system. Such interconnection and parallel operation shall be undertaken in accordance with the terms and conditions of this Agreement. Customer does / does not intend to sell or export any power back to UDC.

2.5 The electric service supplied under this Agreement shall be in the form of \_\_\_\_\_ phase alternating current at approximately 60 Hertz and approximately \_\_\_\_\_ volts.

### 3. AGREEMENT

Now therefore, in consideration of the mutual covenants and agreements hereinafter set forth and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties agree as follows:

### 4. DEFINITIONS

The following terms, when used in this Agreement, shall have the meanings specified:

- 4.1 Agreement: This Agreement titled "Agreement for the Interconnection of Customer's Generation Facility to the UDC Distribution System between (Utility Distribution Company) and (Customer)" together with all Appendices, Schedules and other exhibits attached hereto and incorporated herein by specific reference.
- 4.2 Point(s) of Interconnection: The physical location(s) where UDC's service conductors are connected to Customer's service conductors to allow parallel operation of Customer's GF with UDC's electric distribution system as shown in Appendix A.
- 4.3 Generating Facility (GF): All or part of Customer's electrical generator(s) or inverter(s) together with all protective, safety, and associated equipment and improvements necessary to produce electric power at Customer's Generating Facility, including, but not limited to the Disconnect Switch, as defined herein. A GF shall be understood to include any Qualifying Facility (QF).
- 4.4 Qualifying Facility (QF): Any Cogeneration or Small Power Production Facility that meets the criteria for size, fuel use, efficiency, and ownership as promulgated in 18 CFR, Chapter I, Part 292, Subpart B of the Federal Energy Regulatory Commission's Regulations.
- 4.5 Cogeneration Facility: Any Generating Facility that sequentially produces electricity, steam or forms of useful energy (e.g., heat) from the same fuel source and which are used for industrial, commercial, heating, or cooling purposes.
- 4.6 Small Power Production Facility: A Generating Facility that uses primarily biomass, waste, or renewable resources, including wind, solar, and water to produce electric power.
- 4.7 Minimum Protective Devices, Relays, and Interconnection Requirements: The minimum required protective relaying and/or safety devices or requirements specified in the (UDC) Interconnection Requirements Manual, as may be revised from time to time, for the purpose of protecting (only) THE (UDC) facilities from damage or disruptions caused by a fault, malfunction or improper operation of the Customer's GF. Minimum Protective Relaying and Interconnection Requirements shall not be construed to include additional relaying, protective or safety devices as may be required by industry and government codes and standards, equipment manufacturer requirements and prudent engineering design and practice to fully

protect Customer's GF or facilities; such shall be the sole responsibility of the Customer.

5. EFFECTIVE DATE AND TERM

This Agreement shall become effective on the Effective Date specified in Section 1 and shall remain in effect thereafter unless and until (a) it is terminated by mutual agreement of the Parties, (b) it is replaced by another interconnection agreement, (c) it is terminated by either Party pursuant to a Default of this Agreement as specified in Section 17 hereof, or (d) it is terminated upon thirty (30) day's advance written notice given by either Party. Upon termination of this Agreement, Customer shall be responsible for ensuring that the electrical conductors connecting the GF to the UDC's distribution system are immediately lifted and permanently removed, so as to preclude any possibility of interconnected operation in the future. (UDC) reserves the right to inspect the Customer's premises to verify that the GF is permanently disconnected.

6. INTERCONNECTION FACILITIES AND POINT(S) OF INTERCONNECTION

Customer is responsible for and shall pay for all facilities required to be installed solely to interconnect Customer's GF to the UDC's distribution system including, but not limited to, connection, transformation, switching, protective relaying, metering and safety equipment, including a visibly-open Disconnect Switch, in the manner shown and marked as such on the attached Appendix A, incorporated herein by this reference. All such facilities are to be installed by Customer at Customer's sole expense. During the term of this Agreement Customer shall maintain the GF, connection facilities, and all other materials required hereunder in a safe and in good operating condition.

## 7. NOTICES

All written notices pursuant to this Agreement shall be delivered personally or forwarded by registered or certified mail including express overnight courier service, postage prepaid, return receipt requested to UDC or Customer, as the case may be, at the address of that Party set forth below as follows:

**To (UDC):**

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Telephone: \_\_\_\_\_

**To Customer:**

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Telephone: \_\_\_\_\_

Either Party may change its address for notice by written notice given to the other Party in the manner hereinabove provided. Any such notice shall be deemed to have been duly given and served on the date personally delivered or three (3) business days after the date deposited in the United States mail in accordance with this section.

## 8. ENTIRE AGREEMENT

- 8.1 This Agreement and the documents attached hereto constitute the entire Agreement between the Parties relating to the subject matter hereof, there being no other agreements or understandings, written or oral, other than those contained in this Agreement and the attachments hereto. In the event of a conflict among the provisions of this Agreement and an attached document, this Agreement shall govern. This Agreement does not modify, change or impact any other agreement between the Parties relating to the supply of electric service, or the sale of, or purchase of, electric power.
- 8.2 Conflicts among the attached documents shall be resolved in accordance with the following priority:
- 8.2.1 APPENDIX A: Electrical One-Line and Three-Line Diagrams
- 8.2.2 APPENDIX B: Map of Plant Location and Site Plan
- 8.3 The Parties may amend this Agreement but such amendment may only be effective and enforceable if it is set forth in a written instrument signed by both Parties.

## 9. CUSTOMER'S OBLIGATIONS

- 9.1 Customer agrees not to commence interconnected operation of its GF with the UDC's distribution system, until the installation has been inspected by an authorized UDC representative and final written notification is received from the UDC as to compliance with minimum UDC requirements. Customer shall give at least five (5) Business Days notice to UDC when initial startup is to begin. UDC shall have the right to have a representative present during initial energizing and testing of Customer's Generating Facility.
- 9.2 Customer shall own and be fully responsible for the costs of designing, installing, operating and maintaining:
- 9.2.1 The GF in accordance with the requirements of all applicable construction and safety codes, laws and governmental agencies having jurisdiction.
- 9.2.2 Control and protective devices, in addition to the UDC Interconnection Requirements specified minimum protective relays and devices, to protect its facilities from abnormal operating conditions such as, but not limited to, electrical overloading, abnormal voltages, and fault currents. Such protective devices shall promptly disconnect the GF from UDC's distribution system in the event of a power outage on the UDC's electric system.
- 9.2.3 A visible gang operated load break disconnect switch ("Disconnect Switch"), capable of being locked in a visibly "open" position by a standard



UDC padlock that will completely isolate the GF from the UDC system. Such Disconnect Switch shall be installed in a place so as to provide easy and unrestricted accessibility to UDC personnel on a 24-hour basis. UDC shall have the right to lock open the Disconnect Switch without notice to Customer when interconnected operation of the GF with the UDC's distribution system could adversely affect UDC's electrical system or endanger life or property, or upon termination of this Agreement. The Disconnect shall conform to all requirements specified in the UDC Interconnection Manual.

- 9.2.4 Interconnection facilities on Customer's premises as may be required to deliver power from Customer's GF to the UDC's distribution system at the Point of Interconnection.
- 9.3 The electrical output of Customer's GF shall not contain harmonic content, which may cause disturbances on or damage to the UDC's electrical system, or other parties' systems, such as but not limited to computer, telephone, communication and other sensitive electronic or control systems.
- 9.4 Customer shall exercise reasonable care to assure that the electrical characteristics of its load and GF, such as deviation from sine wave form or unusual short interval fluctuations in power demand or production, shall not be such as to result in impairment of service to other customers or in interference with operation of computer, telephone, television or other communication systems or facilities. The current imbalance for a three phase system, as measured at the customer's service entrance section shall not be greater than ten percent (10%) at any time. The power factor of the Customer's Generating Facility shall not be less than ninety percent (90%) lagging, but shall not be leading, unless agreed to by UDC.
- 9.5 Customer shall protect, operate and maintain the GF in accordance with those practices and methods, as they are amended or changed from time-to-time that are commonly used in prudent engineering and electric utility operations and shall operate and maintain the GF lawfully in a safe manner and non-hazardous condition.
- 9.6 Customer shall submit to UDC, for UDC review and written approval, written equipment specifications, and detailed plans of the interconnections facilities, control and protective devices and settings, and facilities as specified in the UDC Interconnection Requirements Manual, as may be revised from time to time, for the design, installation and operations of its GF prior to their actual installation.
- 9.7 Following UDC written approval of Customer's proposed GF and associated facilities, neither Customer nor its successors or assigns shall remove, alter or otherwise modify or change the equipment specifications, including, without limitation, the plans, control and protective devices or settings, and in general the GF's system specifications configuration or any facilities appurtenant thereto. If Customer desires to make such changes or modifications, Customer shall resubmit to UDC plans describing said changes or modifications for approval by

UDC. No such change or modification may be made without the prior written approval of UDC.

- 9.8 If Customer utilizes the UDC's distribution system to facilitate start-up of its GF, the voltage flicker level shall not exceed UDC standards.
- 9.9 Customer shall obtain and maintain all required permits and inspections indicating that Customer's GF complies with local and other applicable construction and safety codes.

#### 10. MUTUAL UNDERSTANDINGS

- 10.1 UDC shall be allowed to install on Customer's premises any instrumentation equipment for research purposes. Such equipment shall be owned, furnished, installed and maintained by UDC.
- 10.2 UDC's approvals given pursuant to this Agreement or actions taken hereunder shall not be construed as any warranty or representation to Customer or any third party regarding the safety, durability, reliability, performance or fitness of Customer's generation and service facilities, its control or protective devices or the design, construction, installation or operation thereof.
- 10.3 UDC (including its employees, agents and representatives) shall have the right to enter Customer's premises at all reasonable times to (a) inspect Customer's GF, protective devices, and to read or test instrumentation equipment that UDC may install, provided that as reasonably possible, notice is given to Customer prior to entering its premises; (b) maintain or repair UDC equipment; (c) disconnect the GF without notice if, in UDC's opinion, a hazardous condition exists and such immediate action is necessary to protect persons, UDC's facilities or other customers' or third parties' property and facilities from damage or interference caused by Customer's GF, or improperly operating protective devices; (d) open the Disconnect Switch if an operating clearance is required by UDC personnel.
- 10.4 UDC will not install and maintain any lines or equipment on Customer's side of the Point of Interconnection except possibly its meter and some research equipment. For the mutual protection of Customer and UDC, only authorized employees of UDC are permitted to make and energize the service connection between the UDC system and the Customer's service entrance conductors. Such employees carry credentials, which they will show to Customer upon request.
- 10.5 Notwithstanding any other provisions of this Agreement, UDC shall have the right to unilaterally file with the Arizona Corporation Commission (ACC), pursuant to the ACC's rules and regulations, an application for a change in requirements, charges, classification, or service, any rule, regulation or agreement relating hereto.

#### 11. ADDITIONAL TERMS AND CONDITIONS

- 11.1 The GF shall meet the specifications set forth in Section 2.3 and in attached Appendices A and B.

- 11.2 Customer warrants that it has installed or caused to be installed and will maintain the following minimum protective and safety equipment on the GF:
- 11.2.1 A visible open, load break disconnect switch (Disconnect Switch) installed in an approved location so as to provide easy and unrestricted accessibility to UDC personnel on a 24-hour basis, and capable of being locked in the visible "open" position by a standard UDC company padlock.
- 11.2.1 A circuit breaker or contactor on the generator or inverter output.
- 11.2.2 Shutdown minimum protective devices as follows:
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- 11.2.3 Such other equipment as shall mutually be agreed upon by the Customer and UDC from time to time during the term of this Agreement and any extensions thereof.
- 11.3 In the event UDC or its authorized agents lock open the Disconnect Switch, Customer shall not remove or tamper with such lock.
- 11.4 Customer shall, at a minimum, have the shutdown protective devices, specified in Sections 11.2.1, 11.2.2, 11.2.3, and 11.2.4 tested and calibrated at the time of installation by qualified personnel and shall also perform functional testing of these relays and associated generator or inverter breaker. Customer shall provide UDC with a copy of calibration and functional test results. Customer shall also notify UDC at least five (5) Business Days in advance that such tests are to be performed and allow UDC personnel to witness such tests. Customer agrees not to commence interconnected operations of its GF until the installation has been inspected by an authorized UDC representative and final written approval is received from UDC to commence interconnected operation, which approval shall not be unreasonably withheld. Customer shall give UDC at least five (5) Business Days prior notice of when initial startup is to begin. UDC shall have the right to have a representative present during initial energizing and testing of Customer's Generating Facility.
- 11.5 Customer shall have all protective devices tested at time of installation and at intervals not to exceed four (4) years by qualified test personnel. Customer shall either (i) provide UDC with a certified copy of the test results or (ii) notify UDC as to when such tests are to be performed at least five (5) Business Days prior to such tests and allow UDC personnel to witness the test.
- 11.6 Customer agrees to allow UDC and its authorized agents access to the protective relaying and control facilities to conduct whatever periodic tests it may deem necessary, in addition to the requirement set forth in Section 11.5. UDC shall

provide Customer with advance notice of such tests, and Customer's representatives may be in attendance when such tests are performed.

12. SUCCESSORS AND ASSIGNS

Customer may not assign its rights nor delegate its duties under this Agreement, or any part of such rights or duties without the prior written consent of UDC. Any such assignment or delegation made without such written consent shall be null and void. Consent for assignment shall not be withheld unreasonably. This Agreement shall be binding on and inure to the benefit of the respective successors and assigns of the Parties.

13. EFFECT OF SECTION HEADINGS

Section headings appearing in this Agreement are inserted for convenience only, and shall not be construed as interpretations of text.

14. INDEMNITY

Each Party hereby agrees to indemnify the other Party, its officers, agents, and employees for, from and against any and all loss, damages, expenses and liability for injury to or death of any person or injury to or loss of property, to the extent caused by the indemnifying Party's construction, ownership, operation, or maintenance of, or by failure of, any of such Party's works or facilities used in connection with this Agreement. The indemnifying Party shall, at the other Party's request, defend any suit asserting a claim covered by this indemnity. The indemnifying Party shall also pay all costs and expenses that may be incurred by the other Party in enforcing this indemnity, including reasonable attorney's fees. This indemnification shall survive the termination or expiration of this Agreement.

15. GOVERNING LAW

This Agreement shall be governed by, construed, and enforceable in accordance with the laws of the State of Arizona applicable to contracts entered into and to be performed solely within such state, without reference to its principles governing conflicts of laws.

16. FORCE MAJEURE

No Party shall be considered to be in default in the performance of any of its obligations under this Agreement (other than obligations of said Party to pay sums to be paid by it hereunder, and other costs and expenses) when a failure of performance shall be due to a Force Majeure event. A Force Majeure event shall be any cause beyond which, by exercise of due diligence such Party could not reasonably have been expected to avoid or control, and which by exercise of due diligence it shall be unable to overcome or control, including, but not restricted to, failure of or threat of failure of facilities, flood, earthquake, tornado, storm, fire, lightning, epidemic, war, riot, civil disturbance or disobedience, strikes, labor or material shortage, sabotage, restraint by court order or public authority, and action or non-action by or inability to obtain the necessary authorizations or approvals from any governmental agency or authority. Nothing

contained herein shall be construed so as to require a Party to settle any strike or labor dispute in which it may be involved. Either Party rendered unable to fulfill any of its obligations under this Agreement by reason of an uncontrollable force shall give prompt written notice of such fact to the other Party and shall exercise due diligence to remove such inability with all reasonable dispatch.

#### 17. EVENTS OF DEFAULT; REMEDIES

A Party shall be in default hereunder in the event of any of the following:

- (a) Failure to make any payment required hereunder when due after three (3) Business Days written notice;
- (b) A breach of any covenant or obligation under this Agreement which breach is not cured within five (5) Business Days of written notice of such breach.

In the event a Party is in default hereunder, the non-defaulting Party may, in addition to pursuing any other right or remedy available at law or in equity, upon two (2) Business Days written notice to the defaulting Party, terminate this Agreement; provided, however, that neither Party shall have the right to terminate this Agreement if the nature of the other Party's default is such that more than five (5) Business Days are reasonably required for its cure and the defaulting Party commences such cure within said five (5) Business Day period and thereafter diligently prosecutes such cure to completion. Notwithstanding any provision herein to the contrary, EACH PARTY'S LIABILITY WITH RESPECT HERETO SHALL BE LIMITED TO DIRECT ACTUAL DAMAGES ONLY, AND IN NO EVENT SHALL EITHER PARTY BE LIABLE FOR CONSEQUENTIAL, INCIDENTAL, PUNITIVE, EXEMPLARY OR INDIRECT DAMAGES, IN TORT, CONTRACT OR OTHERWISE. UDC shall not be liable to Customer for any damages occasioned by fluctuations, interruptions or curtailment of UDC's electrical system. This limitation on damages survives the expiration or termination of this Agreement. Upon termination of this Agreement, Customer shall immediately permanently lock open the visible blade Disconnect Switch. In the event Customer fails to do so, UDC shall have the right to enter the Property in order to permanently lock open the Disconnect Switch or disconnect service without liability for injury or damage to Customer or any third party and Customer hereby consents to such entry and disconnection.

#### 18. SEVERABILITY

Whenever possible, each provision of this Agreement shall be interpreted in such a manner as to be effective and valid under applicable law, but if any provision of this Agreement is held by a court of competent jurisdiction to be invalid, illegal or unenforceable in any respect under any applicable law or rule in any jurisdiction, such invalidity, illegality or unenforceability will not affect any other provision or any other jurisdiction, but this Agreement will be reformed, construed and enforced in such jurisdiction as if such invalid, illegal or unenforceable provision had never been contained herein or therein.

## 19. WAIVER

The failure by either Party hereto to require strict performance by the other Party of any of the provisions, terms and conditions contained in this Agreement shall not waive, affect or diminish any right of such Party at any time or times hereafter to demand strict performance thereof, and no waiver shall operate as a waiver of any other right or any right with respect to the same condition on a future occasion.

## 20. DISPUTE RESOLUTION

If a dispute arises between the Parties regarding a provision contained in this Agreement, or a Party's performance of its obligations as stated in this Agreement, or any other matter governed by the terms of the Agreement, the Parties agree that such dispute will be resolved in the manner prescribed in this Section.

- 20.1 Initiation and Response: Promptly upon the occurrence of the dispute, the aggrieved Party will notify the other party in writing (the "Claimant's Statement"), setting forth in sufficient detail the basis for the dispute, the aggrieved Party's position and its proposal for resolution of the dispute. Within ten (10) Business Days following receipt of the Claimant's Statement, the other Party will respond in writing (the "Responsive Statement") setting forth in sufficient detail the respondent's position and its proposal for resolution of the dispute.
- 20.2 Good Faith Negotiation: Within ten (10) Business Days after the aggrieved Party's receipt of the Responsive Statement, the Parties will meet and attempt in good faith to expeditiously negotiate a resolution to the dispute. In attendance for each Party at that opening session and throughout the dispute resolution procedure described in this Section will be a representative or representatives of each Party who are authorized to act for the Party and resolve this dispute without resort to higher authority.
- 20.3 Mediation: If the Parties cannot reach a mutually acceptable solution within thirty (30) Business Days after discussions begin, either Party may refer the matter to the Arizona Disputes Resolution Association for appointment of a qualified mediator who has no interest in the outcome of the dispute and who is qualified in the mediation of or commercial disputes as the case may be. The mediator shall be guided by the Parties desire that their objectives be attained as expressed in this Agreement, that their relationship be preserved, and that the dispute be resolved in a fair and equitable manner.
- 20.4 Confidentiality: Negotiations undertaken pursuant to this Section will be deemed confidential as settlement discussions. Nothing said by a Party, nor any position taken during the course of the negotiations will be introduced as evidence by the opposing Party in any subsequent proceedings concerning the same or related transactions.
- 20.5 Condition Precedent: The exhaustion of the dispute resolution procedure provided for in this Section will be construed to be a condition precedent to the initiation of arbitration or legal action in a court of law.

21. ATTORNEY'S FEES

In the event either Party shall institute legal proceedings under or arising out of this Agreement and obtain a judgment or decree in its favor, including appeal to enforce any of the terms of this Agreement, the prevailing Party shall be entitled to recover, in addition to any other remedy, its reasonable actual attorney's fees, court costs, cost of investigation and other related costs allowed by law.

22. INSURANCE/WAIVER OF SUROGATION

Customer hereby agrees that at all times during the term of this Agreement and any extensions thereof, Customer shall maintain public liability and property damage insurance in amounts not less than ONE MILLION DOLLARS (\$1,000,000) per occurrence, which insurance shall cover Customer's use, interconnection and operation of the GF as contemplated in this Agreement. The insurance coverage shall not constitute a limitation of Customer's indemnity under Section 14, Indemnity hereof. Such policy or policies shall identify this Agreement and shall provide for not less than thirty (30) Business Days advance written notice to UDC of cancellation, termination, or alteration. Upon execution of this Agreement, Customer shall deliver a certificate to UDC evidencing that the required policy is in effect. Such certificate shall be sent directly to UDC addressed as follows:

(INSERT ADDRESS OF UDC AND CONTACT PERSON)

Residential Customers who interconnect and operate a static inverter based Generating Facility rated less than 50 kW are exempt from this requirement.

23. SIGNATURE CLAUSE

IN WITNESS WHEREOF, the PARTIES have caused this Agreement to be executed by their duly authorized representatives as of the date hereinabove set forth:

"UDC":

Signature: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date Signed: \_\_\_\_\_

"Customer":

Signature: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date Signed: \_\_\_\_\_



## **APPENDIX A**

### **ELECTRICAL ONE-LINE DIAGRAM, ELECTRICAL THREE-LINE DIAGRAM**

## **APPENDIX B**

### **MAP OF PLANT LOCATION AND SITE PLAN**